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IDEAS, MENTAL FACULTIES AND METHOD

The Logic of Ideas of Descartes and Locke and Its Reception in the Dutch Republic, 1630–1750

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For Leon and Dennis Schuurman

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PREFACE

In the first three chapters of the present study I discuss the content and structure of the logic of ideas, which emerged in the seventeenth century as an alternative to Aristotelian logic. I pay special attention to René Descartes and John Locke, but I consider the substantial contributions made by Antoine Arnauld and Nicolas Malebranche as well. Chapters 1–3 are partly new and partly based on the 'General Introduction' to my edition of Locke's 'Of the Conduct of the Understanding'. Parts of this introduction were used for two articles, 'Locke's Logic of Ideas in Context: Content and Structure', *British Journal for the History of Philosophy* 9 (2001) 439–465 and 'Locke's Way of Ideas as Context for his Theory of Education in *Of the Conduct of Understanding*', *History of European Ideas* 27 (2001) 45–59. In chapter 4 I turn to the Dutch context of the logic of ideas; some of the issues confronted in this chapter were also addressed in 'Locke and the Dutch: a Preliminary Survey', *Geschiedenis van de Wijsbegeerte in Nederland* 11 (2000) 119–140. In chapters 5–9 I discuss the reception of the logic of ideas in five logical textbooks produced in the Dutch Republic between 1690 and 1750. Chapter 5, on Jean le Clerc, draws on a paper presented at an *Arbeitsgespräch* on 'The Early Dutch Enlightenment, 1650–1750, in its European Context' (Wolfenbüttel, 21–23 March 2001), published as 'The Empiricist Logic of Ideas of Jean le Clerc', in: Wiep van Bunge, ed. *The Early Enlightenment in the Dutch Republic, 1650–1750* (Leiden: Brill, 2003) 137–153, while chapter 8, on 's Gravesande, is partly based on a paper, 'Willem Jacob 's Gravesande's philosophical defence of Newtonian Physics: on the various uses of Locke', presented at the conference 'New work on the philosophy of John Locke' (Sydney, 9–11 July 2001), published under the same title in Peter Anstey, ed. *The Philosophy of John Locke. New Perspectives* (London: Routledge, 2003) 43–57.

I have written this book as a research fellow at the Department of Philosophy of the Erasmus Universiteit Rotterdam, as the first of several studies that will appear in a research programme sponsered by NWO (Nederlands Wetenschappelijk Onderzoek), *The Early Enlightenment in the Dutch Republic: Cartesianism, Spinozism, and Empiricism, 1650–1750*, under the excellent supervision of Wiep van Bunge,

who gave his team advice, encouragement and, most important of all, *libertas philosophandi*. I would like to thank him and my other colleagues at the department, Gunther Coppens, Henri Krop, Bart Leeuwenburgh, Han van Ruler and Michiel Wielema, for their warm support and acute criticism. I derived substantial benefit from the remarks made by my friends Simona Brolsma, G.A.J. Rogers, Sami-Juhani Savonius, Craig Walmsley and the late Jan S. Folkers. The same holds true for the comments made on my papers presented at the Wolfenbüttel *Arbeitsgespräch*, the Sydney Locke conference, and the conference 'Britons abroad, strangers at home. Conference on seventeenth-century intellectual history' (Cambridge, 12–13 January 2001). Thanks are also due for Paul Mercken, who scrupulously checked my translations of Latin, French and German quotations. John Schillemans of Woordwerk did a very good job as copy-editor, while Ivo Geradts and Johannes Rustenburg of Typographica Academica Traiectina again wrought typographical miracles. The Louise Thijssen-Schoute Foundation was so kind as to cover the costs of copy-editing and type-setting my text. Finally, this work is dedicated to my nephews, who brought moments of light in times of darkness.

ABBREVIATIONS

Arnauld, *Logique*	Antoine Arnauld and Pierre Nicole, *La Logique ou l'art de penser. Contenant, outre les règles communes, plusieurs observations nouvelles, propres à former le jugement* [=*The Port-Royal Logic*], eds Pierre Clair and François Girbal. Paris: Presses Universitaires de France, 1965.
AT	René Descartes, *Œuvres de Descartes*, eds Charles Adam and Paul Tannery (11 vols). Paris: J. Vrin, 1982–1991.
Crousaz, *Compendium*	Jean-Pierre de Crousaz, *Logicæ compendium*. Groningen: J. Sipkes, 1725.
CSM	René Descartes, *The Philosophical Writings of Descartes*, transl. John Cottingham, Robert Stoothoff, Dugald Murdoch and (vol. III) Anthony Kenny (3 vols). Cambridge: Cambridge University Press, 1984–1991.
Engelhard, *Logica*	Nicolaus Engelhard, *Institutionum philosophiæ theoreticæ tomus prior complectens logicam et metaphysicam quas collegiis privatis destinavit*. Groningen: J. Sipkes, 1743, 2nd ed.
Le Clerc, *Logica*	Jean le Clerc, *Logica, sive ars ratiocinandi*. Amsterdam: J. Wolters, 1692.
Locke, *Essay*	John Locke, *An Essay concerning Human Understanding*, ed. Peter H. Nidditch. Oxford: Clarendon Press, 1975.

Locke, 'Conduct'	'Of the Conduct of the Understanding', ed. Paul Schuurman. Diss. Keele University, 2000 (cited by the newly established paragraph numbers, followed by the conventional section numbers between brackets).
Locke, *Corr.*	*The Correspondance of John Locke*, ed E.S. de Beer. Oxford: Clarendon Press, 1976- (cited by letter number, volume and page number).
Malebranche, *Recherche*	Nicolas Malebranche, *Recherche de la vérité où l'on traite de la nature de l'esprit de l'homme et de l'usage qu'il en doit faire pour éviter l'erreur dans les sciences*, ed. Geneviève Rodis-Lewis (Œuvres de Malebranche, vols I and II). Paris: J. Vrin, 1962–1963.
Musschenbroek, *Institutiones*	Petrus van Musschenbroek, *Institutiones logicæ, præcipue comprehendentes artem argumentandi. Conscriptæ in usum juventutis.* Leiden: S. Luchtmans, 1748.
Sanderson, *Compendium*	Robert Sanderson, *Logicæ artis compendium.* Bologna: CLUEB, 1985 (repr. of Oxford: J. Lichfield, 1618, 2nd edition).
's Gravesande, *Introductio*	Willem Jacob 's Gravesande, *Introductio ad philosophiam. Metaphysicam et Logicam continens.* Hildesheim: G. Olms, 2001 (repr. of Leiden: J. and H. Verbeek, 1737, 2d ed).

Translations of quotations are by me and italics in quotations are by the quoted author, unless otherwise indicated.

CHAPTER ONE

INTRODUCTION

The seventeenth century was a period of sweeping philosophical change that did not stop at the gates of logic. Modern scholars have long remained impervious to the phenomenon of change and development in early modern logic. In 1962 William and Martha Kneale still placed the seventeenth century in the middle of a 400-year period in the history of logic that saw 'scores of textbooks but very few works that contain anything at once new and good'.[1] Since then, historians of logic have mitigated the severe judgement of the Kneales. In his monumental *Die Logik der Neuzeit* (1964–1970), Wilhelm Risse presented the picture of a century that from 1640 onwards witnessed fundamental changes in the conception of logic that were caused by developments in philosophy in general.[2] Similarly, in his preliminary article on logic for the *Cambridge History of Seventeenth-Century Philosophy* (1998), the late Gabriel Nuchelmans pointed to 'a marked discontinuity' between traditional forms of logic, dominated by Aristotelian variants, and views on logic that were influenced by the novel systems of Bacon, Hobbes, Descartes and Gassendi.[3]

The point about a rupture between old and new logic was not lost on such contemporaries as William Molyneux (1656–1698), who in the dedicatory letter to his *Dioptrica Nova*, published in 1693, wrote:

> *Logick has put on a Countenance clearly different from what it appeared in formerly: How unlike is its shape in the* Ars Cogitandi, Recherches de la Verite, *&c. from what it appears in* Smigletius, *and the Commentators of* Aristotle? *But to none do we owe for a greater Advancement in this Part of Philosophy, than to the incomparable* Mr. Locke, *Who, in his* Essay concerning Humane Understanding, *has rectified more received Mistakes, and delivered more profound Truths, established on Experience and Observation, for the Direction of Man's mind in the Prosecution of Knowledge, (which I think may be properly term'd* Logick) *than are to be met with in all the Volumes of the Antients.*[4]

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[1] Kneale, *The Development of Logic*, p. 298.

[2] Risse, *Logik*, II, p. 11.

[3] Nuchelmans, 'Logic in the Seventeenth Century', p. 104.

[4] Molyneux, *Dioptrica*, pp. xl–xli.

Molyneux here makes a fundamental distinction between such Aristotelian textbooks on logic as produced by Martin Smiglecki (1564–1618)[5], and such novel works as Arnauld's *L'Art de penser. La logique de Port-Royal*, published in 1662 (*Ars Cogitandi* is the title of the second, and subsequent, Latin translations, 1674), Malebranche's *Recherche de la vérité* (1674–1675) and Locke's *An Essay concerning Human Understanding* (1689). Another point of note is the broadness of Molyneux's notion of logic. In addition to Arnauld's *Logique*, he also considers Malebranche's *Recherche* as a contribution towards the development of a new logic and he even rates Locke's *Essay* as the crowning achievement of this process, although neither the *Recherche* nor the *Essay* were presented explicitly as systems of logic by their authors.

Taking my clue from Molyneux, I start chapter two with a discussion of Locke's *Essay* as a work of logic and make an attempt at a new and extensive assessment of what John Yolton described, as early as 1955, as the 'logic of ideas'.[6] I shall begin with what I consider the three basic elements of the new logic: ideas (especially clear and distinct ideas), human faculties (e.g. sensory perception, memory, understanding) and method (both rationalist and empiricist) and I shall stress the intimate connection between these topics. Ideas, faculties and method figure in varying degrees in all specimens of the new logic, but none of these deserves the name 'logic of ideas' better than Locke's *Essay*. Consequently, his work forms a suitable point of departure for a history of the logic of ideas—which does not imply, of course, that the *Essay* is *nothing but* a work of logic. I do agree with Molyneux, however, that the *Essay* is the most outspoken specimen of the new logic and I also hold that an analysis of the *Essay* as a work of logic can add to our understanding of this immensely rich work.

Once the Lockean paradigm is established, I turn to Locke's predecessors. I shall argue that some of the elements of the new logic were already introduced by such Aristotelian logicians as Robert Sanderson, but I shall point to Descartes as the greatest source of influence on the new logic. I shall make a detailed comparison between the views of Descartes and Locke on the elements that are central to the new logic. I shall discuss the different epistemolgical thrust that they give to the notion of 'clear and distinct ideas' and I shall

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[5] See Smiglecius, *Logica*.

[6] See Yolton, 'Locke and the Seventeenth-Century Logic of Ideas', *passim*; cf. id. *Locke and the Compass*, ch. 9. For a recent discussion of topics related to the new logic see Easton, *Logic and the Workings of the Mind*.

compare their methods. I shall argue that ascribing a rationalist method to Descartes and an empiricist method to Locke amounts to an oversimplification, and I shall defend the view that they each had two methods, their first method reflecting rationalist and the second empiricist strands.

Although Descartes was of seminal importance for the logic of ideas, he never produced a treatise that brought its main elements together in a single systematic structure. He never faced the task of finding a structure that did justice to the content of the the new logic. In chapter three I shall compare the three different answers given by Arnauld, Malebranche and Locke to the structural problems bequeathed by Descartes.

Taken together, chapters two and three amount to a discussion of the logic of ideas that concentrates on three elements (ideas, faculties and method) and on three wider issues or dimensions: the relation between the *old* (Aristotelian) and the *new* logic (of ideas); the discussion of *rationalist* and *empiricist* epistemologies and methodologies within the framework of the new logic; and the relation between logical *structure* and logical *content.*

With the three elements and the three dimensions of the new logic in place, roughly covering the period between 1630 and 1690, I move forward to the time after the publication of Locke's *Essay.* I put the usefulness of my new characterization of the logic of ideas to the test by studying its reception in five logical textbooks that were published between 1690 and 1750 in the Dutch Republic. After an introductory chapter on the Dutch context (chapter four), I devote the remaining chapters (five-nine) to the textbooks of Jean le Clerc, Jean-Pierre de Crousaz, Nicolas Engelhard, Willem Jacob 's Gravesande and Petrus van Musschenbroek. I shall argue that each of these textbooks was influenced by the three main elements of the logic of ideas and that each has its own unique position on the three axes that are determined by tradition and novelty, rationalism and empiricism, and structure and content.

CHAPER TWO

THE LOGIC OF IDEAS

2.1. *Locke: Ideas, Faculties and Method*

Locke's 'way of ideas' gives a two-stage analysis of the human understanding on its way to certain or probable knowledge. Since the prime subject of the *Essay* is supposed to be the understanding,[1] it might be asked why such excessive attention should be devoted to ideas. In the final paragraph of the Introduction Locke offers both an answer to this question as well as a definition of 'idea':

> Thus much I thought necessary to say concerning the Occasion of this Enquiry into humane Understanding. But, before I proceed on to what I have thought on this Subject, I must here in the Entrance beg pardon of my Reader, for the frequent use of the Word *Idea*, which he will find in the following Treatise. It being the Term, which, I think, serves best to stand for whatsoever is the Object of the Understanding when a Man thinks, I have used it to express whatever is meant by *Phantasm, Notion, Species*, or whatever it is, which the Mind can be employ'd about in thinking; and I could not avoid frequently using it.[2]

So, since the understanding has no other object but its ideas, any discussion of the former implies scrutiny of the latter as well.[3]

In the first stage of Locke's two-stage way of ideas we must take care to arm ourselves with ideas that are clear and distinct. In an addition to the 'Epistle to the Reader' that was included in the fourth edition of the *Essay*, he observes that it would be better to replace 'clear and distinct' by 'determinate' or 'determined'.[4] Yet 'clear and

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[1] Locke, *Essay*, 'Epistle to the Reader', p. 6: 'the Subject of this Treatise, the UNDERSTANDING'.

[2] *Ibid.* I. i. 8, p. 47.

[3] *Ibid.* IV. i. 1, p. 525: 'Since *the Mind*, in all its Thoughts and Reasonings, hath no other immediate Object but its own *Ideas*, which it alone does or can contemplate, it is evident, that our Knowledge is only conversant about them.' For two short introductions to the heavily debated topic of the precise nature of Lockean ideas, see 'Idea', in: Yolton, *A Locke Dictionary*, pp. 88–93 and Ayers, 'Ideas and Objective Being', pp. 1090–1094.

[4] Locke, *Essay*, 'Epistle to the Reader', pp. 12–14.

distinct' was allowed to remain a current expression in the fourth (and also the fifth) *Essay*.[5] In the *Essay* Locke explains that simple ideas are clear 'when they are such as the Objects themselves, from whence they were taken, did or might, in a well-ordered Sensation or Perception, present them'.[6] Complex ideas are clear only in so far as the simple ideas of which they are composed are also clear. The opposite of a clear idea is an obscure idea. Obscurity of ideas can be caused by 'dull Organs; or very slight and transient Impressions made by the Objects; or else a weakness in the Memory, not able to retain them as received'.[7] Next, Locke defines a distinct idea by comparing it with a clear idea: 'As a *clear Idea* is that whereof the Mind has such a full and evident perception, as it does receive from an outward Object operating duly on a well-disposed Organ, so a *distinct Idea* is that wherein the Mind perceives a difference from all other [ideas]'.[8] The opposite of a distinct idea is a confused idea: 'a *confused Idea* is such an one, as is not sufficiently distinguishable from another, from which it ought to be different'.[9] Clear and distinct ideas shall be discussed at greater length in a later section (§2.4), but for the moment it is enough to note that both clarity and distinctness play an important role in Locke's epistemology, the difference between these two concepts being that clarity pertains to the relation between an idea and the object or objects from which it is taken, while distinctness is a property of the relation between one idea and all other ideas.

The activity of 'discovering how far we have clear and distinct *Ideas*'[10] forms the first stage in Locke's way of ideas. In the second stage these ideas are compared. Two ideas can be compared either

[5] In 1697–1698 Edward Stillingfleet, Bishop of Worcester, had published three lenghty attacks on the *Essay*; see Stillingfleet, *Three Criticisms of Locke*. He read Locke's 'clear and distinct ideas' in the Cartesian sense of being intellectual. Although Stillingfleet failed to appreciate that for Locke clear and distinct ideas are ultimately sense-derived rather than intellectual, Locke took the trouble of responding to this criticism with the above-mentioned addition to the 'Epistle to Reader' in the fourth edition. Furthermore, in this edition he deleted 'clear and distinct' in those passages that Stillingfleet had attacked, leaving untouched many others that had not been mentioned explicitly by the Bishop. For instances of Locke replacing 'clear and distinct' by 'determined', see also the Oxford Bodleian Library MS of Locke's 'Conduct', MS Locke e. 1, p. 157 and p. 158. See also Stewart, 'Stillingfleet', p. 256.

[6] Locke, *Essay*, II. xxix. 2, p. 363.

[7] *Ibid.* II. xxix. 3, p. 363.

[8] *Ibid.* II. xxix. 4, p. 364.

[9] *Ibid.* II. xxix. 4, p. 364.

[10] *Ibid.* IV. iii. 22, p. 553.

directly (in propositions),[11] or indirectly (in 'reasonings'). The difference between these direct or indirect comparisons runs parallel with Locke's distinction between intuitive and demonstrative knowledge. Intuitive knowledge arises when 'the Mind perceives the Agreement or Disagreement of two *Ideas* immediately by themselves, without the intervention of any other'.[12] In the case of demonstrative knowledge, when the mind is not capable of perceiving at once the agreement or disagreement of two ideas, 'it is fain, by the Intervention of other *Ideas* (one or more, as it happens) to discover the Agreement or Disagreement, which it searches; and this is that which we call *Reasoning*'.[13]

The knowledge that results from a comparison between ideas can be certain or probable. One of the eminently important aspects of Locke's *Essay* is that it gives a separate and respectable status to probable knowledge by a detailed examination of 'the Reasons and Degrees of *Assent*'.[14] In the fourth part of his *Essay* he tries to give precise criteria for the reliability of various degrees of probable knowledge.[15] (Since according to Locke all knowledge is certain, 'probable knowledge' is strictly speaking a contradiction in terms; his own preferred expression is 'probability'.[16])

Although clear and distinct ideas are necessary for the subsequent generation of certain or probable knowledge, this is not sufficient. In addition, if we want this process to be efficient, it is desirable that we do not 'dwell upon only particular Things'.[17] Rather, we should make use of abstract ideas. Abstract ideas form the elements of the abstract principles that underpin scientific and moral knowledge. Abstract ideas are not formed at once; the mind has to bind its individual perceptions 'into Bundles, and rank them so into sorts, that what Knowledge it gets of any of them, it may thereby with assurance extend to all of that sort; and so advance by larger steps in that, which is its great Business, Knowledge'.[18] All this means that

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[11] For Locke on the difference between verbal and mental propositions see below, §2.4.

[12] Locke, *Essay*, IV. ii. 1, pp. 530–531.

[13] *Ibid.* IV. ii. 2, p. 532.

[14] *Ibid.* I. i. 3, p. 44. For Locke on 'probable truths' see also: 'Miscellaneous Papers', in: King, *The Life of John Locke*, II, p. 153; and Daston, 'Probability and Evidence', *passim.*

[15] Locke, Essay, esp. IV. xvi. 1–14, pp. 657–668.

[16] *Ibid.* IV. xv. 3, p. 655.

[17] *Ibid.* II. xxxii. 6, p. 385.

[18] *Ibid.* II. xxxii. 6, p. 386.

the relation between the two stages of the way of ideas is one of a complicated interaction. On the one hand, the first stage provides the building bricks, consisting of abstract ideas that are clear and distinct, for the subsequent process of reasoning in the second stage. On the other hand, the clarity and distinctness and the abstractness of these elements is not given, but the result of previous polishing by reasoning.

The critical importance of clear and distinct ideas and the relative ease with which our mind is subsequently able to trace the connections between these ideas, implies that the first stage carries more weight than the second stage. This point is borne out when we consider the types of error that are related to the two stages. An error of the first type is to accept ideas that are obscure or confused as the basis of subsequent reasoning; an error of the second type is a defect in reasoning itself. Both types of error are discussed more extensively in 'Of the Conduct of the Understanding' than in the *Essay* itself. This small work was originally conceived, in 1697, as an additional chapter to the *Essay*, but was never finished and published in 1706, two years after Locke's death, in the *Posthumous Works*. The 'Conduct' neatly sums up both types of error in a single clause:

> [1] the want of determined Ideas and [2] of Sagacity and exercise in finding out and laying in order intermediate Ideas[19]

Locke devotes much space to errors of the first type, but suggests that once we have managed to get before us the basic material, clear and distinct ideas, we are not likely to make mistakes in any subsequent reasoning. Thus he writes in the 'Conduct':

> The faculty of Reasoning seldom or never deceives those who trust to it. its consequences from what it builds on are evident and certain but that, which it oftenest if not only misleads us in, is that the principles from which we conclude the grounds upon which we bottom our reasoning are but a part[20]

Locke's views expressed in his two-stage way of ideas are closely linked to his well-known attacks on Aristotelian logic in general and syllogisms in particular. From the late sixteenth century onwards syllogisms had held a place of eminence in the study of valid inference.[21] They formed the principal target of Locke's attacks on Aristotelian

[19] Locke, 'Conduct', par. 98 (§3).
[20] Locke, 'Conduct', par. 98 (§3).
[21] Ashworth, 'Traditional Logic', p. 164.

'Masters of Logick'.[22] As we have noted, the first stage of his way of ideas implies a careful inspection of the clarity and distinctness of our ideas. Locke's problem with syllogisms, however, is that they are used, and can even be used correctly, without this prior inspection. Syllogisms merely consist of words, and for a syllogism to be correct, its words do not have to correspond with clear and distinct ideas. Syllogisms are ideal vehicles for senseless disputations. As to the second stage: whereas Locke is optimistic about the capacity of our natural faculties in tracing the natural connections between our ideas, his point about syllogisms is that their order is not natural, but very artificial. This makes them superfluous.[23] If syllogisms have any use at all in 'the Schools', it is that they allow their members 'without Shame to deny the Agreement of *Ideas*, that do manifestly agree'.[24] Also, syllogisms can be used for the exposition of existing knowledge, but are of no use for the generation of new knowledge. The order of syllogisms is the product of a previous quest for intermediary ideas, not their source.[25]

Locke's anti-Aristotelian analysis of ideas is connected with two other key subjects of the *Essay*: that of our mental faculties and that of method. Instead of focusing on the formalization of reasoning, the new logic concentrates on a prior inspection of the mental faculties: sensory perception, memory, and the comparing, enlarging, composition and abstraction of ideas. More generally, when he compares it with the will, Locke speaks about the faculty of understanding.[26] This is the 'most elevated Faculty of the Soul'.[27] The understanding is at work in both stages of the way of ideas; it takes our ideas apart until they are clear and distinct and it compares them to generate knowledge.

The other vital subject of the *Essay* that is directly linked to the way of ideas (and to our mental faculties as well) is that of method. According to Locke, method is the answer to the question of how we can best use our faculties in our pursuit of (certain or probable) knowledge. The kind of method to be used depends on the kind of ideas that are presented to our mental faculties. Two kinds of ideas are of special relevance here: modes and ideas of substances. Modes

[22] Locke, *Essay*, III. vi. 32, p. 459. Locke's most comprehensive discussion of syllogisms is in *ibid.* IV. xvii. 4–8, pp. 670–681.

[23] *Ibid.* IV. xvii. 4, p. 671.

[24] *Ibid.* IV. xvii. 4, p. 675.

[25] *Ibid.* IV. xvii. 6, p. 679.

[26] *Ibid.* II. xxi. 17, p. 242.

[27] *Ibid.* 'Epistle to the Reader', p. 6.

are 'such complex *Ideas*, which however compounded, contain not in them the supposition of subsisting by themselves'.[28] An important category of modes is formed by the abstract ideas of mathematics, and the method suited for the study of modes is that of Euclid's geometrical demonstration.[29] Locke, in accordance with many contemporaries, is an admirer of this method because it generates certain knowledge. He claims that this method can also be used in ethics, provided we give precise definitions of basic concepts like 'property' or 'injustice'.[30]

In the case of ideas of material substances, and also in the case of our own understanding, i.e. spiritual substance, we are less fortunate. The problem with substances is that since we have no knowledge of their real essence, we are in the dark about the necessary co-existence of the diverse qualities that follow from this essence. In the case of ideas of material substances and of our own understanding, Locke prefers his 'Historical, plain Method'.[31] This well-known phrase can be broken down into three elements.[32]

Firstly, there is the importance of experience. In the case of material substances, as opposed to modes, 'the want of *Ideas* of their real *Essences* sends us from our own Thoughts, to the things themselves, as they exist'.[33] In the same way, if we want to give a history of human knowledge, we must appeal to experience and observation, and 'examine Things as really they are, and not to conclude they are, as we fancy our selves, or have been taught by others to imagine'.[34]

Secondly, Locke's method is *historical*. Like other contemporaries, he uses the term 'history' in both a general and a particular way. The general way is consistent with the primary connotation of the Greek word ἱστορία, meaning enquiry or investigation, or the report containing the results of such an enquiry.[35] In addition, Locke uses

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[28] *Ibid.* II. xii. 4, p. 165.

[29] *Ibid.* IV. xii. 7, p. 643.

[30] *Ibid.* IV. iii. 18, pp. 549–550.

[31] *Ibid.* I. i. 2, p. 44.

[32] For a somewhat different treatment of the subject cf. Romanell, 'The Scientific and Medical Genealogy of Locke's "Historical, Plain Method"', *passim*. For the importance of Locke's cooperation with Thomas Sydenham (1624–1689) for his historical method see Walmsley, 'John Locke's Natural Philosophy (1632–1671)', *passim*, and my General Introduction to Locke, 'Conduct', pp. 37–47.

[33] Locke, *Essay*, IV. xii. 9, p. 644.

[34] *Ibid.* II. xii. 15, p. 162. See also Locke, *Some Thoughts concerning Education*, § 189, p. 241; and Yolton, *Locke and the Compass*, pp. 16–43.

[35] See Locke, *Essay*, I. i. 2, p. 44. For the use of 'history' by Locke and some predecessors, cf. Buickerood, 'The Natural History of the Understanding', p. 157, n. 4.

the word 'history' in the more limited sense of events happening in time, or the result of an inquiry into these events. He gives an example of this usage when he concludes: 'And thus I have given a short, and, I think, true *History of the first beginnings of Humane Knowledge*; whence the Mind has its first Objects, and by what steps it makes its Progress to the laying in, and storing up those *Ideas*, out of which is to be framed all the Knowledge it is capable of'.[36] The diachronic nature of the object of Locke's enquiry is matched by the step-by-step method by which he tries to investigate it; the operations of our understanding are like material substances in that they cannot be grasped at a time in 'whole Sheaves'.[37]

Thirdly, although Locke's step-by-step history of our mental faculties has a limited scope of generalization, this is compensated by the fact that it can have great practical value in our daily life. Here we encounter another aspect of Locke's pervasive polemic against the 'useless Imagination of the Schools'.[38] Also, there is again a parallel with material substances, of which we cannot have more than a narrowly circumscribed knowledge either, which however may give us great 'Advantages of Ease and Health'. In a similar way it may be of great practical use to know the limits of our understanding: 'If we can find out, how far the Understanding can extend its view; how far it has Faculties to attain Certainty; and in what Cases it can only judge and guess, we may learn to content our selves with what is attainable by us in this State.'[39]

So, the *Essay* not only contains a massive assault on Aristotelian logicians, but provides us with an alternative as well. A central role is played by a two-stage way of ideas, which also influences the two other major subjects: faculties and method. Our mental faculties are 'about' our ideas and the method by which we endeavour to obtain knowledge depends on the kind of ideas that are presented to our faculties. The result is a logic that is more subject-oriented, that is less formal, and that is focused more on epistemological and psychological questions than what Locke in the 'Conduct' described as the 'Logick now in use'.[40] His logic is a 'logic of ideas'.[41] However,

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[36] Locke, *Essay*, II. xii. 15, p. 162.

[37] *Ibid.* IV. xii. 12, p. 647.

[38] *Ibid.* IV. vi. 8, p. 582.

[39] *Ibid.* I. i. 4, p. 45.

[40] 'Conduct', par. 2 (§ 1).

[41] For an alternative term see Buickerood, 'The Natural History of the Understanding', *passim*, who prefers 'facultive logic', which is plausible, given the close connection between ideas and faculties. However, in Locke's logic the accent is rather

his logic was not developed *de novo*; if we want to gain a deeper understanding of this logic we must continue, rather surprisingly perhaps, with one of his peripatetic contemporaries.

2.2. *Robert Sanderson: an Aristotelian Predecessor*

Locke's years as student and tutor in Oxford had offered him ample opportunity to become acquainted with various specimens of Aristotelian logic. Yet his repeatedly evoked spectre of the old logic is in many ways a caricature of his own making. At the beginning of the seventeenth century key disciplines in the Aristotelian tradition such as logic, physics and metaphysics, had already ceased to be the chief studies at Oxford and elsewhere. Nor was reading confined to commentators on Aristotle. Rather, the curriculum had acquired a distinctly humanistic flavour that showed especially in the attention given to language and literature. Logic was still an important element of most European undergraduate curricula, but its perceived function had changed. Whereas many scholastic philosophers had valued logic as a science that was capable of generating new knowledge, many scholars with a humanistic background tended to regard logic as an instrumental art that helped pupils in directing their minds and in organizing knowledge they had already acquired by other means. Although logic thus gained a new relevance due to its perceived capability of forming the minds of the young it had to share this role with mathematics.[42]

Most contemporaries of Locke (and also many of his successors) perceived no conflict between the contribution of traditional Aristotelian logic and that of mathematics towards the same instrumental goal. For example, although Thomas Sprat (1635–1713), founding member of the Royal Society, denied the usefulness of Aristotelian logic in the generation of new knowledge, he at the same time acknowledged that disputing, a favourite activity of traditional logicians, 'is a very good instrument, to sharpen mens wits, and to make them versatil, and wary defenders of the Principles, which they already know'.[43] If Locke showed more aggression here this was because he wanted to supplant Aristotelian logic with his own logic.

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on the former than on the latter. For an example of what with more justice could be called a 'facultative logic', see below (§3.2) in my discussion of Malebranche.

[42] See Feingold, 'The Humanities', *passim*.

[43] Sprat, *The History of the Royal-Society*, p. 18.

The Bodleian Library MS Locke f. 11, fols. 7v.–57, gives us some information about the peripatetic works on logic that Locke is likely to have been acquainted with. It is a small booklet that lists accounts of money received from and disbursed for the benefit of his pupils from 1661 to 1666, when he was a tutor at Christ Church. Amongst items such as shoes, stockings, wood and chamber pots, Locke also entered the authors of the books that were bought for the students under his supervision. He gave three explicit references to general works on logic: 'Du Trieu's Logick', 'Sandersons Logick' and 'Smith's Logic'.[44] These names reflect the then common preponderance in Oxford of contemporary authors of textbooks over the works of mediaeval logicians or Aristotle himself. By the seventeenth century Aristotelian textbooks had become imbued with numerous mediaeval and some stoic elements. However, their basic content was still based on Aristotle's logic itself, and their structure accorded with the ordering of Aristotle's work that had been used ever since about 200 AD under the collective name of *Organon* ('instrument' of science).

The first book of Aristotle's *Organon* is the *Categories*, which deals with simple terms: subjects and predicates. In *De interpretatione* the core subject is that of the propositions which are formed by these terms. Propositions in their turn are the elements of syllogisms, which are treated in both *Analytics*. The *Analytica priora* gives a formal analysis of the structure of syllogisms in general. Syllogisms consist of two premises and one conclusion that is based on these premises. The two premises of each syllogism always share one term, which is called the middle term. The middle term connects the subject term or *minor* of one premise with the predicate term or *major* of the other premise. The *Analytica posteriora* is about the type of syllogisms that are used for a demonstration or scientific proof, and discusses themes related to the philosophy of science and to scientific method (e.g. the question of how we can find the first principles of the different sciences). The *Topica* is on dialectics, and deals with the practice of reasoning on probable rather than scientific or certain premises. Finally there is *De sophisticis elenchis*, which deals with errors, i.e. sophistical syllogisms. So, Aristotle's logic is structured into three

[44] MS Locke f. 11, resp. fol. 8r, 10v and again 10v. Locke's entry 'Sandersons Logick' is ambiguous, in so far as there circulated in England a text on logic by another Sanderson, whose first name was John: the *Institutionum dialecticarum libri quatuor* (1589). However, this book was less well known than the work by Robert Sanderson and does not have the word 'logic' in the title.

levels: terms (subjects and predicates), propositions and syllogisms. Syllogisms can be demonstrative (certain), dialectical (probable) or sophistical (contentious).

Of the three general logical textbooks referred to by Locke, the *Logicæ Artis Compendium* (1615)[45] by Robert Sanderson (1587–1663), Bishop of Lincoln (1660–1663), is the most interesting. The *Compendium* was the most popular textbook on logic in seventeenth-century England.[46] Sanderson's logic remains firmly within peripatetic bounds, and in the first appendix the author gives generous praise to the medium that was to be mercilessly attacked by Locke: that of the disputation.[47] The *Compendium* is organized according to a conventional tripartite division of terms—propositions—syllogisms that mirrors the structure of the Aristotelian *Organon*:

I. On simple terms.
II. On propositions.
III. On discourse.[48]

The last part comprises a discussion of demonstrative, topical and sophistical syllogisms. This third part ends with some cursory remarks on '*Ordo* seu *Methodus*'. The subject of method with the logical text as its locus had been revived in the sixteenth century by Petrus Ramus (1515–1572) and Jacobus Zabarella (1532–1589). Ramus had ended his *Libri Scholarum dialecticarum* with a book on method, which for him consisted mainly in a dichotomous ordering of existing bodies of knowledge; thus the book on method is aptly called '*de Elenchis dispositionis*'.[49] In Zabarella's *De methodis libri quatuor* we find, in addition to a discussion of the disposition of entire bodies of

[45] I use a reproduction of the 1618 edition.

[46] Ashworth, 'Introduction' to Sanderson, *Compendium*, p. xvi. Locke mentions Sanderson in a letter to W. Molyneux as someone who owed his mastery of Latin to repeated readings of Cicero (Locke, *Corr.* 1921, V, p. 405, 2 July 1695). Locke owned a copy of the *Compendium* and also two other works by the same author (*De juramenti promissorii obligatione prælectiones septem* and *De obligatione Conscientiæ*, nrs 2547 and 2548 in Harrison, *The Library of John Locke*, p. 225). He had probably known Sanderson personally. The Bishop was an important source of influence on Locke's early *Essays on the Law of Nature*, written shortly after 1660; see von Leyden, 'Introduction' to Locke, *Essays on the Law of Nature*, pp. 30–34.

[47] Sanderson, *Compendium*, 'Appendix Prima', ch. 3, pp. 40–41 (a new sequence of page numbers starts from the first appendix onwards).

[48] Sanderson, *Compendium*: 'I. De Simplicibus Terminis', 'II. De Propositionibus' and 'III. De Discursu'.

[49] Ramus, *Libri Scholarum dialecticarum*, XX. i, in: *Scholæ in liberales artes*, col. 588. On Ramus' preference for dichotomous keying, see Jardine, 'Humanistic logic', pp. 185–186.

existing knowledge, an examination of methods that are supposed to provide new answers for individual new problems by *methodus demonstrativa* (synthesis) and *methodus resolutiva* (analysis).[50] The synthetical method goes forward, from principles to conclusions, while the analytical method goes backward, from conclusions to the principles from which these have been inferred. Sanderson is not completely blind to method as a device for the generation of new knowledge, but shows little interest in this possibility; for him method remains first of all concerned with order.[51]

Sanderson shows humanist influences in his definition of logic, which is not conceived as a science but as an 'instrumental art that guides our mind in becoming acquainted with everything intelligible'.[52] Corresponding to this view of logic as an instrument in directing our minds is his likening of the three principal parts of logic to the three principal activities of the mind: the conception of simple terms; the composition and division of propositions; and argumentation and method, the instruments of discourse. Sanderson's appreciation of a psychological side of logic, however, has no consequences for its conventional content nor for its equally conventional division into three parts. At least, this holds true for the main text of the *Compendium*. The first chapter of the second appendix is rather more interesting. The title of this chapter is 'De Quinque Habitibus mentis', 'On the five states of the mind'. Different disciplines require different mental states[53] and it is important to have a knowledge of these states, of which there are five: *intellectus principiorum* (knowledge of principles, pertaining to philosophical knowledge), *scientia* (science) and *sapientia* (wisdom) are all required for speculative knowledge, while *prudencia* and *ars* are required for practical knowledge. The first state is required for the knowledge of causes while the remaining four are required for the knowledge of different kinds of consequences.

Sanderson draws consequences from his explicit attention to mental states as a factor in the acquisition of knowledge that would be given even more weight in the logic of ideas. The Bishop points out that errors are not to be sought in the reasoning of adversaries (a

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[50] Zabarella, *De methodis*, III. ii, col. 225: 'facere autem ex notis cognitionem ignoti est differentia, qua methodus ab ordine separatur'.

[51] Sanderson, *Compendium*, III. 30, pp. 225–226.

[52] *Ibid.* I. 1, p. 1: 'ars instrumentalis, dirigens mentem nostram in cognitionem omnium intelligibilium'; also: *ibid.* 'Appendix Prima', p. 67; and *ibid.* 'Appendix Posterior', p. 102: '*Logica* rationem dirigit, & ordinatur ad intellectum perficiendum'.

[53] *Ibid.* 'Appendix posterior', 89–90.

habit to which, according to Locke, especially Aristotelian logicians were prone), but in the workings of our own mind. He points out that error itself is a mental state: 'Error is a state by which the mind is inclined to assent without fear of what is false'.[54] He thus seems to present an important argument for the use of a logic that examines our mental states. At the beginning of the chapter, however, Sanderson declares that his remarks on mental states do not belong to logic proper. The chapter is part of an appendix that has been given the extremely noncommittal title of 'Miscella'. In addition, it is telling that for his enumeration of five mental states he does not draw on Aristotle's *Organon*, but on a passage in the *Ethica Nicomachea*.[55] Still, the fact remains that Sanderson includes this subject in a textbook on logic, if only in an appendix. He hopes that although this general subject does not belong to logic proper, it may be of use to young students.[56] This may be an expression of his opinion concerning the instrumental function of logic as a general art that is supposed to direct and order the intellect. Sanderson's *Compendium* is an example of the increased interest in psychological and epistemological aspects within logic, but has not yet reached a verdict on the best place for these subjects within the frame of an Aristotelian textbook on logic.

To summarize, the logic of Sanderson has a traditional tripartite structure that reflects the main levels in Aristotle's logic: those of terms, propositions and syllogisms. Some elements, however, such as an (admittedly casual) treatment of methodological problems and an (as yet limited) interest in a more subject oriented logic, already point to future developments.

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[54] *Ibid.* 'Appendix posterior', p. 97: 'Error est *habitus, quo mens inclinatur ad assentiendum sine formidine falsitati.*'

[55] Aristotle, *Ethica nicomachea*, 6.3. 1139b14–18: "Αρξάμενοι οὖν ἄνωθεν περὶ αὐτῶν πάλιν λέγωμεν. ἔστω δὴ οἷς ἀληθεύει ἡ ψυχὴ τῷ καταφάναι ἢ ἀποφάναι, πέντε τὸν ἀριθμόν· ταῦτα δ'ἐστὶ τέχνη ἐπιστήμη φρόνησις σοφία νοῦς· ὑπολήψει γὰρ καὶ δόξῃ ἐνδέχεται διαψεύδεσθαι', 'Let us begin, then, from the beginning, and discuss these states once more. Let it be assumed that the states by virtue of which the soul possesses truth by way of affirmation or denial are five in number, i.e. art, knowledge, practical wisdom, philosophic wisdom, comprehension; for belief and opinion may be mistaken'. Transl. Barnes, II, p. 1799.

[56] Sanderson, *Compendium*, 'Appendix posterior', p. 89.

2.3. *Locke's Cartesianism*

Although the logical textbooks that Locke had first prescribed, and later came to vilify, foreshadow some elements of his informal logic, we must turn to Descartes as the most influential philosopher before Locke in formulating each of the main characteristics of the new logic. The use of 'idea' in the seventeenth century can in most cases be traced back to its (re)introduction by Descartes.[57] He developed the epistemological concept of 'clarity and distinctness', stressed the importance of a prior survey of our mental faculties, and put this requirement at the centre of his method of doubt. Descartes and Locke are the two dominant forces in the history of the logic of ideas and an analysis of the resemblances and differences between their logic is therefore essential.

According to Lady Masham, his friend and landlady, Locke himself had paid tribute to the importance of Descartes in his development as a philosopher. In her letter of 12 January 1705, containing biographical information about Locke that Jean le Clerc was to use for his 'Eloge du feu M. Locke', Lady Masham wrote:

> The first Books (as *Mr Locke* himself has told me) which gave him a relish of Philosophical Studys were those of *Descartes* He was rejoyced in reading of these because tho' he very often differ'd in Opinion from this Writer, he yet found that what he said was very intelligible: from whence he was incourag'd to think That his not haveing understood others, had, possibly, not proceeded altogether from a defect in his Understanding[58]

Locke possessed the principal works of Descartes as well as an edition of his correspondence.[59] During his stay in France he had made a detailed list of the Frenchman's works in his journal (8 August 1677).[60] On 7 March 1678, between two observations about a female patient suffering from 'a violent loosnesse', he used his journal for a more substantial note on a 'Methode pour bien etudier la doctrine

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[57] Nuchelmans, 'Logic in the Seventeenth Century', p. 109. The use of ideas in a theory of language, as a third element together with words and things existing outside us, was by no means new. Many scholastic authors used a similar triad consisting of words, concepts and things. However, their opinions tended to diverge about the exact relation between these elements; see Ashworth, "'Do Words Signify Ideas or Things?"', pp. 322–324. The triad of words, concepts and things is mentioned only very briefly in Sanderson, *Compendium*, I. 7, p. 22.

[58] Amsterdam University Library, MS R.K. – J 57a (no page numbers).

[59] Harrison, *The Library of John Locke*, nrs 601a–609, pp. 101–102.

[60] MS Locke f. 2, pp. 226–227.

de Mr de Cartes', advising readers to start with the *Discours de la méthode* while also giving the works of some well-known Cartesian philosophers.[61]

Locke was not only indebted to Descartes for much of the positive part of his logic, but also for its *pars destruens.* His attacks on syllogisms had been well-prepared by Descartes and also by Francis Bacon. Locke's point that syllogisms are based merely on words and that Aristotelian philosophers fail to check the correspondence between words and things, had already been made by the latter.[62] Furthermore, the assertion that the syllogism is first of all an expository device that does not add much in the way of finding new knowledge had been put forward by both Bacon and Descartes.[63] Next, we have also noticed that Locke made the explicit charge of the circular character of syllogisms; they do not give rise to new knowledge since they are not the source but only the product of new knowledge. The same complaint is made by Descartes in his *Regulæ ad directionem ingenii* (the very title of which prefigures Locke's 'Of the Conduct of the Understanding').[64] Finally, Locke echoes Descartes in the way he derides the unnecessary artificial character of syllogisms. This last point is explained best when we look at the influence of Descartes on the positive side of Locke's logic of ideas.

In the *Regulæ* Descartes had stressed the importance of surveying our instruments of knowledge as an important step in the develop-

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[61] MS Locke f. 3, pp. 49–60; transcribed in: Locke, *An Early Draft*, pp. 105–111.

[62] Bacon, *De dignitate augmentis scientiarum*, V, ii, in: Bacon, *Works*, I, p. 621: 'Nam syllogismi ex propositionibus consistunt; propositiones ex verbis; verba notionum tesseræ sunt; quare si notiones ipsæ (quæ verborum animæ sunt) male et varie a rebus abstrahuntur, tota fabrica corruit'; see also *Novum Organum*, Aph. xiii and xiv, in: Bacon, *Works*, I, p. 158.

[63] Bacon, *De dignitate augmentis scientiarum*, V, ii, in: Bacon, *Works*, I, pp. 621–633; Descartes, *Discours*, AT VI, p. 17: 'ie pris garde que, pour la Logique, ses syllogismes & la pluspart de ses autres instructions seruent plutost a expliquer a autruy les choses qu'on sçait, ou mesme, comme l'art de Lulle, a parler, sans iugement, de celles qu'on ignore, qu'a les apprendre'.

[64] Descartes, *Regulæ*, Regula X, AT X, p. 406: 'nullum posse Dialecticos syllogismum arte formare, qui verum concludat, nisi priùs ejusdem materiam habuerint, id est, nisi eandem veritatem, quæ in illo deducitur, jam antè cognoverint'. The *Regulæ* were not published in the Latin version in which they were originally written until 1701, but during the time that Locke was working on his *Essay*, its contents may very well have been available to him. Manuscript copies are known to have circulated in the Netherlands and France, a Dutch translation was published in 1684 (Locke was able to read Dutch), and the second and subsequent editions of the *Port-Royal Logic* (1664) contained substantial fragments that were based on the MS in the possesion of Clerselier. See 'Avertissement' to the *Regulæ*, AT X, pp. 351–353 and Bonno, *Les Relations intellectuelles*, p. 236.

ment of his new method.[65] The most important of these instruments is the intellect, to which are added imagination, sense-perception and memory.[66] In what has been dubbed his 'facultative model',[67] the laws of logic are dictated by the laws of thought, rather than the other way round. This orientation forms the background for Descartes's attack on the artificial character of Aristotelian logic. According to Descartes, the main weakness of Aristotelian formal logic was its inability to reflect the natural powers of our mental faculties, which left to themselves are quite able to make a correct inference. This is thanks to what he called our *lumen naturale* or *intuitus*, by which he did not understand

> the fluctuating testimony of the senses or the deceptive judgement of the imagination as it botches things together, but the conception of a clear and attentive mind, which is so easy and distinct that there can be no room for doubt about what we are understanding. Alternatively, and this comes to the same thing, intuition is the indubitable conception of a clear and attentive mind which proceeds solely from the light of reason. Because it is simpler, it is more certain than deduction, though deduction, as we noted above, is not something a man can perform wrongly.[68]

It is thanks to this *intuitus* that Descartes knows that he exists, that he thinks and that a triangle is bound by three sides and a sphere by a single surface.[69] Locke has much the same confidence in our 'native rustick Reason'.[70] He seems to repeat Descartes when he writes about intuition: 'This part of Knowledge is irresistible, and like the bright Sun-shine, forces it self immediately to be perceived, as soon as ever the Mind turns its view that way; and leaves no room for Hesitation, Doubt, or Examination, but the Mind is presently filled with the clear Light of it.'[71] According to Locke it is thanks to this natural ease by which the process of inference can be accomplished that errors of

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[65] Descartes, *Regulæ*, Regula VIII, AT X, p. 398.

[66] *Ibid.* Regula XII, AT X, p. 411.

[67] Gaukroger, *Cartesian Logic*, p. 130.

[68] Descartes, *Regulæ*, Regula III, AT X, p. 368: 'Per *intuitum* intelligo, non fluctuantem sensuum fidem, vel malè componentis imaginationis judicium fallax; sed mentis puræ & attentæ tam facilem distinctumque conceptum, vt de eo, quod intelligimus, nulla prorsus dubitatio relinquatur; seu, quod idem est, mentis puræ et attentæ non dubium conceptum, qui à solâ rationis luce nascitur, & ipsâmet deductione certior est, quia simplicior, quam tamen etiam ab homine malè fieri non posse suprà notavimus'. Transl. CSM, I, p. 14.

[69] Descartes, *Regulæ*, Regula III, AT X, p. 368.

[70] Locke, *Essay*, IV. xvii. 6, p. 679.

[71] *Ibid.* IV. ii. 1, p. 531.

the second type, concerning inference, are less to be feared than errors of the first type, concerning the basis of inference, i.e. our ideas (see above, §2.1). The importance attached to intuition is an instance of the trend towards a more subject oriented logic. Instead of trying to convince others by discursive means, which had been the prime objective of Aristotelian logicians, the goal of the logic of ideas was personal assurance.[72]

2.4. *Descartes and Locke: Clarity and Distinctness*

The framework of the logic of ideas offered room for different epistemological and methodological views. These differences are manifestly present in the discussion of clarity and distinctness by Locke and Descartes. A definition of Locke's notion of clarity and distinctness was already given above (§2.1). For a definition of these concepts by Descartes, recourse can be taken to his *Principia philosophiæ*:

> I call a perception 'clear' when it is present and accessible to the attentive mind—just as we say that we see something clearly when it is present to the eys's gaze and stimulates it with a sufficient degree of strength and accessibility. I call a perception 'distinct' if, as well as being clear, it is so sharply separated from all other perceptions that it contains within itself only what is clear.[73]

The first difference between Locke and Descartes on the topic of clarity and distinctness is that they give divergent epistemological thrusts to these concepts. Descartes's prime epistemological objective is to dismiss scepticism. Clarity and distinctness are supposed to bridge the gap between what we think and what exists outside our mind. When, in the *Meditationes*, Descartes writes that he can 'lay it down as a general rule that whatever I perceive very clearly and distinctly is true',[74] the implication is that clarity and distinctness is doing a job

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[72] See also Gaukroger, *Cartesian logic*, pp. 127–128 and Kennedy, 'The Alliance between Puritanism and Cartesian Logic', pp. 563–564.

[73] Descartes, *Principia*, I. xlv, AT VIII-A, p. 22: 'Claram voco illam, quæ menti attendenti præsens & aparta est: sicut ea clarè à nobis videri dicimus, quæ, oculo intuenti præsentia, satis fortiter & apertè illum movent. Distinctam autem illam, quæ, cùm clara sit, ab omnibus aliis ita sejuncta est & præcisa, ut nihil planè aliud, quàm quod clarum est, in se contineat.' Transl. CSM, I, pp. 207–208.

[74] Descartes, *Meditationes*, AT VII, p. 35: 'ac proinde jam videor pro regulâ generali posse statuere, illud omne esse verum, quod valde clare & distincte percipio'. Transl. CSM, II, p. 24.

that cannot be left to the senses.[75] We have seen him stressing this point in his definition of *intuitus* (§2.3); instead of setting his stakes on 'the fluctuating testimony of the senses', he confides in 'the indubitable conception of a clear and attentive mind which proceeds solely from the light of reason'.

By contrast, Locke does not think that the clarity and distinctness of an idea can be used as a bridge to the existence of things, nor does he think that he needs such a link. Locke assumes that the ontological relation between our natural faculties (including our senses) and the things in nature that are perceived by these faculties, guarantees an epistemological fit between natural subject and natural object. Provided our understanding is properly trained, we are able to perceive the natural connections between our ideas and to see the difference between natural and unnatural connections and associations. Whether this basic trust was justified is of course open to discussion, but it explains much of Locke's impatience with philosophical scepticism, which he has been noted to treat 'in a cavalier fashion'.[76] At the same time, Locke observes that the mental faculties given to us by God come 'exceeding short of the vast Extent of Things'.[77] The topic of the narrow cognitive limits which God has conferred on us in our 'present state' is stressed repeatedly in the *Essay*, especially in book IV.[78] However, Locke stresses

> That *the certainty of* Things existing *in rerum Naturâ*, when we have *the testimony of our Senses* for it, is not only *as great* as our frame can attain to, but *as our Condition needs*. For our Faculties being suited not to the full extent of Being, nor to a perfect, clear, comprehensive Knowledge of things free from all doubt and scruple; but to the preservation of us, in whom they are; and accommodated to the use of Life: they serve to our purpose well enough, if they will but give us certain notice of those Things, which are convenient or inconvenient to us.[79]

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[75] For pre-Cartesian uses of 'clear and distinct', see Stewart, 'Stillingfleet', p. 248, n. 7.

[76] Yolton, *Locke and the Compass*, p. 12; see also Rogers, 'Locke and the Sceptical Challenge', esp. pp. 38–42.

[77] Locke, *Essay*, I. i. 5, p. 45.

[78] *Ibid.* IV. iii. 6, pp. 539–543; *ibid.* IV. iii. 22, p. 553; *ibid.* IV. iv. 14, p. 570; *ibid.* IV. xi. 8, pp. 634–635; *ibid.* IV. xii. 10, p. 645; *ibid.* IV. xiv. 2, p. 652 and *ibid.* IV. xvi. 4, pp. 659–661; see also Locke, 'Of Study', p. 419.

[79] Locke, *Essay*, IV. xi. 8, p. 634; see also *ibid.* I. i. 5, p. 45: God has given men 'Light enough to lead them to the Knowledge of their Maker, and the sight of their own Duties'.

In general, our natural faculties tell us what things are good and thus to be pursued and what things are bad and thus to be avoided, and this makes them suitable enough for our present state.

Given this background it is not surprising that when Locke is discussing the intuition of clear and distinct ideas, he is not interested first of all in the relation between ideas and things outside us. His concern is rather another relation, that between an idea and other ideas. Knowledge consists in the perception of the agreement or disagreement of ideas. Locke values intuition not primarily as a power that gives us knowledge about the existence of things, but as a faculty that enables us to see that different ideas are not the same and that the same ideas are not different, and thus 'that *White* is not *Black*, That a *Circle* is not a *Triangle*, That *Three* are more than *Two*, and equal to *One* and *Two*'.[80] Thus, in so far as clarity pertains to the relation between ideas and things and distinctness to the relation between ideas, it can be said that for Descartes the most relevant dimension of intuition is clarity while for Locke it is distinctness.

Yet this neat picture needs some amendment in the case of Locke's concept of distinctness. He admits that, strictly speaking, confusion between different ideas is impossible:

> For let any *Idea* be as it will, it can be no other but such as the Mind perceives it to be; and that very perception, sufficiently distinguishes it from all other *Ideas*, which cannot be other, *i. e.* different without being perceived to be so. No *Idea* therefore can be undistinguishable from another, from which it ought to be different, unless you would have it different from it self: for from all other, it is evidently different.[81]

However, we give names to our ideas and we should not forget that every idea, whether simple or complex, should have a precise name and every name should refer only to this idea and not to another idea. The problem is that human beings have great difficulty in adhering to this fundamental law and this gives wide scope for confusion: 'Now every *Idea* a man has, being visibly what it is, and distinct from all other *Ideas* but it self, that which makes it *confused* is, when it is such, that it may as well be called by another Name, as that which it is expressed by'.[82] So, confusion is not really a property of the relation between ideas, but rather of the relation between words on the one hand and ideas on the other.

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[80] See *ibid.* IV. ii. 1, p. 531. For the different opinions of Descartes and Locke on the problem of scepticsm, see Rogers, 'Descartes and the Mind of Locke', *passim.*

[81] Locke, *Essay*, II. xxix. 5, p. 364.

[82] *Ibid.* II. xxix. 6, p. 364.

A second difference between Descartes and Locke is that the former uses the concept of clarity and distinctness as a criterion of truth while the latter does not. Let me start this complicated issue by repeating Descartes's phrase in the *Meditations*, where he states 'that whatever I perceive very clearly and distinctly is true'. It should be noted that clarity and distinctness is presented here not primarily as an attribute of ideas but of perceptions. While all ideas are perceptions, not all perceptions are ideas. Perceptions can be of things (or the affections of things) and of propositions. This distinction can be found in the *Meditationes* but is made most explicitly in the *Principia*, where Descartes says 'All the objects of our perception we regard either as things, or affectations of things, or else as eternal truths which have no existence outside our thought.'[83] The category of eternal truths consists of *communes notiones*; these *notiones* are *communes* exactly *because* they can be perceived clearly and distinctly.[84] As examples Descartes mentions that it is impossible that the same thing exists and does not exist, that what has been done cannot be undone, and that he who thinks cannot fail to exist while he thinks. *Notiones communes* include the axioms of mathematics as well.[85] For the category of 'things'—non-propositional things, to be more precise—we can switch back to the *Meditations*, were 'things' are presented as those objects of which we have ideas. Ideas are the images of these objects: 'So it is clear to me, by the natural light, that the ideas in me are like <pictures, or> images which can easily fall short of the perfection of the things from which they are taken, but which cannot contain anything greater or more perfect.'[86] Ideas can be divided into three kinds: 'Among my ideas, some appear to be innate, some

[83] Descartes, *Principia*, I. xlviii, AT VIII-A, p. 22: 'Quæcunque sub perceptionem nostram cadunt, vel tanquam res, rerumve affectiones quasdam, consideramus; vel tanquam æternas veritates, nullam existentiam extra cogitationem nostram habentes.' Transl. CSM, I, p. 208.

[84] Descartes, *Principia*, I. l, AT VIII-A, p. 24: 'Et quidem, quantum ad has communes notiones, non dubium est quin clarè ac distinctè percipi possint, alioqui enim communes notiones non essent dicendæ'.

[85] 'Axiomata sive Communes Notiones', Descartes, *Meditationes*, 'Secundæ Responsiones', AT VII, p. 164; 'communis notio, sive axioma', id. *Principia*, I. xlix, AT VIII-A, p. 23.

[86] Descartes, *Meditationes*, AT VII, p. 42: 'Adeo ut lumine naturali mihi sit perspicuum ideas in me esse veluti quasdam imagines, quæ possunt quidem facile deficere a perfectione rerum a quibus sunt desumptæ, non autem quicquam majus aut perfectius continere.' Transl. CSM, II, p. 29.

to be adventitious, and others have been invented by me.'[87] In his letter to Mersenne from about 16 June 1641, Descartes gives a similar tripartition of ideas. This time he elucidates his division with some examples. He mentions ideas that come from elsewhere, such as the idea one has ordinarily of the sun; next, there are ideas that are made or invented, such as the idea of the sun in the deductions of astronomers; and finally there are innate ideas 'such as the idea of God, mind, body, triangle, and in general all those which represent true, immutable and eternal essences'.[88]

So, ideas can refer to different objects, but none of the ideas mentioned in Descartes's tripartition is a proposition. This brings us to a problem. If, as Descartes holds, clarity and distinctness is a criterion of truth, and if (the absence or presence of) clarity and distinctness is not only a property of propositions but also of ideas, than the conclusion is that ideas are true or false in so far as they are, or are not, clear and distinct. Truth and falsity, however, are generally considered to be properties of propositions, and ideas are not propositions. How, then, can ideas be true or false? Descartes was aware of this problem, and the following remark in the *Meditationes* can be taken as the first step in his analysis of the problem: 'First, however, considerations of order appear to dictate that I now classify my thoughts into definite kinds, and ask which of them can properly be said to be the bearers of truth and falsity.'[89] Trying to answer the question of what kind of thoughts can be said to be true or false, Descartes first considers ideas, which are again given the image characterization: 'Some of my thoughts are as it were the images of things, and it is only in these cases that the term "idea" is strictly appropriate—for example, when I think of a man, or a chimera, or the sky, or an angel, or God.'[90] He then proceeds with the remark that ideas cannot, properly speaking, be true or false:

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[87] Descartes, *Meditationes*, AT VII, pp. 37–38: 'Ex his autem ideis aliæ innatæ, aliæ adventitiæ, aliæ a me ipso mihi videntur.'

[88] Letter CCXLIII, Descartes to Mersenne, [16 June 1641], AT III, p. 383: 'vt Idea Dei, Mentis, Corporis, Trianguli, & generaliter omnes quæ aliquas Essentias Veras, Immutabiles & Æternas representant'. Transl. CSM, III, p. 183.

[89] Descartes, *Meditationes*, AT VII, pp. 36–37: 'Nunc autem ordo videtur exigere, ut prius omnes meas cogitationes in certa genera distribuam, & in quibusnam ex illis veritas aut falsitas proprie consistat, inquiram.' Transl. CSM, II, p. 25.

[90] Descartes, *Meditationes*, AT VII, p. 37: 'Quædam ex his tanquam rerum imagines sunt, quibus solis proprie convenit ideæ nomen: ut cùm hominem, vel Chimæram, vel Cœlum, vel Angelum, vel Deum cogito.' Transl. CSM, II, p. 25.

> Now as far as ideas are concerned, provided they are considered solely in themselves and I do not refer them to anything else, they cannot strictly speaking be false; for whether it is a goat or a chimera that I am imagining, it is just as true that I imagine the former as the latter ... Thus the only remaining thoughts where I must be on my guard against making a mistake are judgements.[91]

Nevertheless, Descartes does use the term 'true idea' and 'false idea'. His reflections on true and false ideas are occasioned by his distrust of certain sensory impressions. In the *Meditationes* he points out that the external sensory ideas of colours, sounds, warmth and cold and the internal sensory ideas of pain and hunger are so obscure that we have good reason to doubt whether these ideas correspond with real objects. Moreover, the example of a *chimæra* already showed that considering ideas as images does not necessarily imply that the object of each idea exists. Ideas are 'materially false' when this correspondence is lacking and 'materially true' when it is present.[92] Descartes limits *material* truth and falsity to this particular case of the presence or absence of a correspondence relation between ideas and objects. He admits that the more general and the more proper sense of truth and falsity pertains to judgements, i.e. propositions, not to ideas; for this proper sense Descartes reserves the concept of *formal* truth and falsity.[93] Finally, he weakens this clear distinction between formal and material by suggesting that it is possible to assign a quasi-propositional character to material truth and falsity. A materially true idea of (x) does not only contain (x) itself but also the correct assumption that (x) exists; so, any *materially* true *idea* of (x) can be rewritten as the *formally* true *proposition* '(x) exists'.[94] Thus, in so far as material truth can be rewritten as formal truth, it is possible to speak without contradiction about 'true ideas' or 'false ideas'

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[91] Descartes, *Meditationes*, AT VII, p. 37: 'Jam quod ad ideas attinet, si solæ in se spectentur, nec ad aliud quid illas referam, falsæ proprie esse non possunt; nam sive capram, sive chimæram imaginer, non minus verum est me unam imaginari quàm alreram ... Ac proinde sola supersunt judicia, in quibus mihi cavendum est ne fallar.' Transl. CSM, II, p. 26. See also id. *Meditationes*, AT VII p. 43: 'falsitatem proprie dictam, sive formalem'.

[92] Descartes, *Meditationes*, AT VII p. 43 'an sint veræ, vel falsæ, hoc est, an ideæ, quas de illis habeo, sint rerum quarundam ideæ, an non rerum.'

[93] For Descartes on his scholastic sources for the difference between material and formal truth, see *Meditationes*, 'Quartæ Responsiones', AT VII, p. 235.

[94] See Descartes to Mersenne, letter CCXLV, [July 1641], AT III, p. 393, on ideas 'qui sont dans l'esprit' and ideas 'qui sont dans la fantaisie'; both can be expressed 'par des noms ou par des propositions'.

in Descartes's logic, even when truth and falsity are considered as exclusive properties of propositions.

Contrary to Descartes, Locke does not use clarity and distinctness as a criterion of truth. We have already seen (§ 2.1) that he uses clarity and distinctness as a property of individual ideas; so, this property belongs firmly to the first stage of his two-stage logic. Truth, on the other hand is 'nothing but *the joining or separating of Signs, as the Things signified by them, do agree or disagree one with another.*'[95] These signs can be either ideas or words. In both cases, 'The *joining* or *separating* of signs here meant is what by another name, we call Proposition.'[96] When the signs that are joined or separated are ideas, they form a *mental* proposition. When the signs are words, the result is a *verbal* proposition. Since Locke describes truth as a property of propositions, and since propositions belong to the second stage of his logic of ideas, the criterion of truth is clearly situated in the second stage, not in the first stage. The clarity and distinctness of individual ideas is a condition for the subsequent activity of correctly joining or separating these ideas, but the criterion of truth must be sought in the latter and not in the former stage.

Given these clear-cut distinctions, it is not surprising that Locke explicitly denies that truth and falsity (second stage) can be a property of individual ideas (first stage). He echoes Descartes when he writes:

> The *Idea* of a Centaur, having no more Falshood in it, when it appears in our Minds; than the Name Centaur has Falshood in it, when it is pronounced by our Mouths, or written on Paper. For Truth or Falshood, lying always in some Affirmation, or Negation, Mental or Verbal, our *Ideas* are *not capable* any of them *of being false*, till the Mind passes some Judgment on them; that is, affirms or denies something of them.[97]

Yet, remarkably enough, he speaks frequently about true ideas and false ideas. Again like Descartes, however, Locke attaches clear strictures to these expressions:

> When-ever the Mind refers any of its *Ideas* to any thing extraneous to them, they are then *capable to be called true or false.* Because the Mind in such a reference, makes a tacit Supposition of their Conformity to that Thing: which Supposition, as it happens to be *true* or *false*; so the *Ideas* themselves come to be denominated.[98]

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[95] Locke, *Essay*, IV. v. 2, p. 574, see also *ibid.* II. xxxii. 19, p. 391.
[96] *Ibid.* IV. v. 2, p. 574.
[97] *Ibid.* IV. xxxii. 3, p. 385.
[98] *Ibid.* IV. xxxii. 4, p. 385.

Locke is not happy with this terminology, but he acquiesces in its usage with a sigh: 'what Words are there, that are not used with great Latitude, and with some deviation from their strict and proper Significations?'[99] So, although Locke's use of truth and falsity in connection with individual ideas is not consistent with his distinction between the two stages of this logic, he is aware of the inconsistency and, like Descartes, he limits the terminology to the same particular category of what the Frenchman had called material truth and falsity.

Finally, it should be noted that the contrast between the two stages of Locke's logic of ideas is due in large part to clarity and distinctness being always a property of individual ideas (first stage) and never of propositions (second stage). This distinction is weaker in Descartes, in the sense that he uses clarity and distinctness not only in relation to individual ideas, but also in relation to *notiones communes*, i.e. propositions. However, Descartes still propounds a two-stage model in the wider sense of stressing clear and distinct perceptions (whether of individual things or of propositions) as a condition for subsequent valid reasoning. This is exactly the kind of preliminary function fulfilled so admirably by mathematical axioms.[100]

2.5. *Descartes and Locke: Rationalism and Empiricism*

We have seen (§2.1) that Locke's logic of ideas contains two different methods: one for ideas of substances and one for modes. Another question is how these methods relate to Locke's epistemological views. I shall compare the answer to this question with the epistemology and methodology of Descartes. In modern secondary literature there has been growing consensus about the limitations of the Kantian sobriquets 'empiricist' and 'rationalist' in trying to distinguish between epistemological and methodological positions of early modern philosophers. We shall see, however, that these concepts, even when we adhere to their ordinary textbook meaning, can still do useful work to describe different strands of thinking in the philosophies of Descartes and Locke.[101] In his *Dictionary of Philosophy*

[99] *Ibid.* IV. xxxii. 1, p. 384.

[100] See also Schuurman, '*Ex naturæ lumine & Aristotele*', p. 247, n. 56.

[101] See Ayers, 'Theories of Knowledge and Belief', p. 1004: 'The distinction between "rationalists" and "empiricists" has come increasingly under attack as a construct of Kantian criticism. Yet it is appropriate to bring the distinction to bear on the seven-

Antony Flew gives the following characteristics of the rationalism of Descartes, Spinoza and Leibniz:

> (a) the belief that it is possible to obtain by reason alone a knowledge of the nature of what exists; (b) the view that knowledge forms a single system, which (c) is deductive in character; and (d) the belief that everything is explicable, that is, that everything can in principle be brought under the single system.[102]

Flew defines empiricism as

> the thesis that all knowledge or at least all knowledge of matters of fact as distinct from that of purely logical relations between concepts—is based on experience.[103]

Given these definitions, it is not difficult to connect Locke's 'Historical, plain Method' for substances with an empiricist epistemology. His method for modes demands more circumspection. In so far as modes, whether mathematical or moral, are praised as the reliable elements of a deductive system, they meet condition (c) of a rationalist epistemology. By definition, however, modes do not suppose the existence of things outside us that correspond to our ideas of these things; consequently, modes fail to fulfil requirement (a). So, Locke's method for modes is deductive but not fully rationalist. What remains, however, is Locke's admiration for the certainty of reasoning that is based on modes. He starts with the demonstrative certainty of mathematics, makes the point that in principle this certainty is also attainable for ethics, and only then turns to substances, where recourse must be taken to experience, because 'the want of *Ideas* of their real *Essences* sends us from our Thoughts to the things themselves, as they exist' (see above, §2.1). To the extent that the absence of any need to consult our senses is considered an asset, while the necessity of taking recourse to our experience in the case of substances is considered a liability, Locke was an empiricist *faute de mieux.*

Locke's position is in many ways remarkably similar to Descartes. The Frenchman also espoused two methods. This may seem a surprising statement, given the emphasis that Descartes puts on the unity of all knowledge. In the preface to the French translation of his *Principia*

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teenth century just because it corresponds to an ancient way of marking an argument about method and scientific knowledge which was among the direct determinants of early modern theories.'

[102] Article 'rationalism' in Flew, *Dictionary*, pp. 298–299.

[103] Article 'empiricism' in *ibid.* p. 104.

philosophiæ he makes the well-known comparison of his philosophic system with a tree, its roots forming his metaphysics, its trunk his general physics and its branches individual disciplines: medicine, mechanics and ethics.[104] When speaking about his system as a whole, Descartes indeed stresses its mathematical certainty. When he gives his famous four methodical rules in the second part of his *Discours*:

> The first was never to accept anything as true if I did not have evident knowledge of its truth: that is, carefully to avoid precipitate conclusions and preconceptions, and to include nothing more in my judgements than what presented itself to my mind so clearly and distinctly that I had no occasion to doubt it.
>
> The second, to divide each of the difficulties I examined into as many parts as possible and as may be inquired in order to resolve them better.
>
> The third, to direct my thoughts in an orderly manner, by beginning with the simplest and most easily known objects in order to ascend little by little, step by step, to knowledge of the most complex, and by supposing some order even among objects that have no natural order of precedence.
>
> And the last, throughout to make enumerations so complete, and reviews so comprehensive, that I could be sure of leaving nothing out.[105]

these are associated with the 'long chains composed of very simple and easy reasonings' of geometers, but Descartes does not forget to add that these rules can provide us with certainty about 'all things which can fall under human knowledge'[106]. The Cartesian vision is

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[104] Descartes, *Principes*, AT IX-B, p. 14: 'Ainsi toute la Philosophie est comme vn arbre, dont les racines sont la Metaphysique, le tronc est la Physique, & les branches qui sortent de ce tronc sont toutes les autres sciences, qui se reduisent à trois principales, à sçavoir la Medicine, la Mechanique & la Morale, j'entens la plus haute & la plus parfaite Morale, qui, presupposant vne entiere connoissance des autres sciences, est le dernier degré de la Sagesse.'

[105] Descartes, *Discuours*, AT VI, pp. 18–19: 'Le premier estoit de ne receuoir iamais aucune chose pour vraye, que ie ne la connusse euidemment estre telle: c'est a dire, d'euiter soigneusement la Precipitation, & la Preuention; & de ne comprendre rien de plus en mes iugemens, que ce qui se presenteroit si clairement & si distinctement a mon esprit, que ie n'eusse aucune occasion de le mettre en doute. Le second, de diuiser chascune des difficultez que i'examinerois, en autant de parcelles qu'il se pourroit, & qu'il seroit requis pour les mieux resoudre. Le troisiesme, de conduire par ordre mes pensées, en commençant par les obiets les plus simples & les plus aysez a connoistre, pour monter peu a peu, comme par degrez, iusques a la connoissance des plus composez; et supposant mesme de l'ordre entre ceux qui ne se precedent point naturellement les vns les autres. Et le dernier, de faire partout des denombremens si entiers, & des reueuës si generales, que ie fusse assuré de ne rien omettre.' Transl. CSM, vol. I, p. 120.

[106] Descartes, *Discours*, AT VI, p. 19: 'Ces longues chaisnes de raisons, toutes simples

that of one science, a *mathesis universalis*, with one method.[107] Within this mathematical method, Descartes makes the Zabarellian distinction between analytical and synthetical reasoning (see above, §2.2). In the 'Second Replies' to the *Meditationes*, Descartes explains that we can proceed either synthetically, and start with general axioms from which we can deduce conclusions about particular truths, or analytically and start with particular problems until we have arrived at their constituent clear and distinct ideas.[108] The first direction is most suited for the proof of truths that we have already obtained and is used most typically in traditional geometry. The second direction is especially apt for the discovery of new truths and is used with great success in Descartes's analytical algebra.

Although Descartes boasts that his philosophy contains no explanation 'that is not mathematical and evident',[109] the reality of his system belies the vision. There is a rift running right through the middle of the Cartesian system, and this has far-reaching methodological consequences. The rift is most apparent in the *Principia*. In part I Descartes starts with the Archimedean point of his *cogito*. The existence of his own spirit subsequently gives him assurance of the existence of God thanks to whom we know that we are not deceived in the truth of our clear and distinct ideas of immaterial things. From the metaphysical principles of the existence of an immutable God, Descartes then deduces the general principles of his mechanistic physics of matter in motion in part II, including his three Laws of Nature and the statement that nature has a corpuscular structure.[110] The exact way in which these laws are deduced from God's immutability need not detain us here; however, I take it that this deduction has an *a priori* character, in the sense that it goes from cause (metaphysical principle) to effect (physical principles) and that it is not based on sensory knowledge.[111] Ideally, Descartes would like to continue

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& faciles, dont les Geometres ont coustume de se seruir, pour paruenir a leurs plus difficiles demonstrations, m'auoient donné occasion de m'imaginer que toutes les choses, qui peuuent tomber sous la connoissance des hommes, s'entresuiuent en mesme façon'. Transl. CSM, I, p. 120.

[107] Descartes, *Regulæ*, Regula IV, AT X, p. 378.

[108] Descartes, *Meditationes*, AT VII, pp. 155–159.

[109] Descartes to Plempius, letter LXXXVIII, 3 October 1637, AT I, p. 421: 'nempè, quod eo philosophandi genere vtar, in quo nulla ratio est, quæ non sit mathematica & euidens'.

[110] Laws of Nature: *Principia*, II, xxxvii, xxxix, xl, AT VIII-A, pp. 62–65; corpuscularism: *ibid.* II, xxxiv, AT VIII-A, pp. 59–60.

[111] When Descartes mentions sensory experiences in relation to his physical principles in *Principia* II, these are limited to an illustrative role. For instance, when he

this, according to him, certain deduction by deriving the explanation of 'other things' from his physical principles. Here, however, his project grinds to a halt; the reason for this is given most clearly not in the *Principia*, but in the *Discours*:

> But I must also admit that the power of nature is so ample and so vast, and these principles so simple and so general, that I notice hardly any particular effect of which I do not know at once that it can be deduced from the principles in many different ways; and my greatest difficulty is usually to discover in which of these ways it depends on them. I know no other means to discover this than by seeking further observations whose outcomes vary according to which of these ways provides the correct explanation.[112]

Descartes's physical principles are so wide that it is possible to deduce more than one explanation for each of the different physical phenomena. On this level of the explanation of the individual physical phenomena, treated in parts III and IV of the *Principia*, the ideal method of demonstratively certain *a priori* deduction has to be supplemented with a method that is *a posteriori* in the sense that it goes from effect to cause with the help of sensory experience. In these parts of the *Principia*, Descartes uses theoretical models, which consist of hypotheses about the corpuscular micro-structure of nature that are illustrated by mechanical analogies with objects on a visible macro-level. These models form part of a larger theory formed by his Laws of Nature and are presented not as certain knowledge but as merely plausible accounts of reality. On this level of the explanation of phenomena, Descartes makes extensive use of sensory experience. This at least is the method that he *pretends* to follow; in a letter to

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discusses his second Law of Nature (*Principia*, II, xxxix, AT VIII-A, pp. 63–65), he first makes the point that this law is caused by God's immutability and only then proceeds with the empirical exemple ('exempli causa') of a stone shot from a sling. Cf. Adam, *Vie et œuvre de Descartes*, AT XII, p. 14; Shea, 'Cartesian Clarity and Cartesian Motion', pp. 31–32; Clarke, *Descartes' Philosophy of Science*, p. 103, 101, 104; and Nadler, 'Deduction, Confirmation', p. 360.

[112] Descartes, *Discours*, AT VI, pp. 64–65: 'Mais il faut aussy que i'avouë, que la puissance de la Nature est si ample & si vaste, & que ces Principes sont si simples & si generaux, que ie ne remarque quasi plus aucun effect particulier, que d'abord ie ne connoisse qu'il peut en estre deduit en plusieurs diuerses façons, & que ma plus grande difficulté est d'ordinaire de trouuer en laquelle de ces façons il en depend. Car a cela ie ne sçay point d'autre expedient, que de chercher derechef quelques experiences, qui soient telles, que leur euenement ne soit pas le mesme, si c'est en l'vne de ses façons qu'on doit l'expliquer, que si c'est en l'autre.' Transl. CSM I, p. 144. For the contrast between ideal and reality in Cartesian method cf. Rogers, 'Descartes and the Method of English Science', pp. 238–244.

Constantijn Huygens (1596–1687) he even goes so far as saying that he has checked his physical explanations with as many 'experiences' as there are lines in his writings.[113]

So, Locke's preoccupation with method, the choice of two kinds of method, and the connection between two kinds of method and two specific epistemologies, are present already in Descartes. Descartes's ideal of a geometrical deduction, which he claimed to have realized at the level of metaphysical and physical principles, is to a large extent the method that Locke would propound for the analysis of modes. Moreover, Descartes's use of models and Locke's historical method are both empiricist. However, this is where resemblances stop.

Firstly, the two methods of both Descartes and Locke both reflect a bipartition, but these divisions are of a different nature. Descartes's division runs right through his physics. On one side of the line are the abstract principles of his physics and on the other side are his explanations for the different phenomena in nature. Locke's division, on the other hand, involves no split physics. The study of modes is confined to the field of mathematics and to ethics, i.e. disciplines that do not posit the existence of physical objects in the external world that correspond to the ideas we have of them. By contrast, this correspondence is assumed for ideas of substances, which comprise the entire field of physics, without a distinction between principles and phenomena. Whereas for Descartes there is no fundamental difference between the principles of physics and those of mathematics,[114] for Locke physics is an object of empirical investigation while mathematics is not.

Secondly, Descartes used experiences as a means of testing the plausibility of the hypotheses of his physical models. With these hypotheses he tried to bridge the gap between the visible world and the invisible micro-structures of his corpuscular physics. Much of the polemic thrust in Locke's historical method is directed exactly

[113] Letter CCCLXXXII, [June 1645], AT IV, pp. 224–225: 'Car i'admire que, nonobstant que i'aye demontré, en particulier, presque autant d'experiences qu'il y a de lignes en mes écrits, & qu'ayant generalement rendu raison, dans mes Principes, de tous les Phainomenes de la nature, i'aye expliqué, par mesme moyen, toutes les experiences qui peuuent estre faites touchant les cors inanimez, & qu'au contraire on n'en ait iamais bien expliqué aucune par les principes de la Philosophie vulgaire, ceux qui la suiuent ne laissent pas de m'obiecter le défaut d'experiences.' For a more extensive discussion of Descartes's hybrid physics, see Schuurman, 'René Descartes' hybride fysica', *passim.*

[114] Descartes, *Principia*, II, lxiv, AT VIII-A, p. 78 (in margin): 'Non alia principia in Physicâ, quàm in Geometricâ, vel in Mathesi abstractâ, à me admitti, nec optari'; see also 'Conversation with Burman', AT V, p. 160.

against such ventures into the invisible. They form the background of his dislike for hypotheses; in a letter to William Molyneux of 15 June 1697 he wrote: 'I have always thought, that laying down, and building upon hypotheses, has been one of the great hindrances of natural knowledge'.[115] By insisting that we stick to the level of the immediately observable, Locke's historical method remains much more in line with the common sense character of Aristotelian philosophy than is the case with Descartes's abstract physics of matter in motion.

A third difference is that in practice Descartes, and even more so his followers, emphasized his first (rationalist) method, while in practice Locke stressed his own second (empiricist) method.

To conclude our comparison between Descartes and Locke in the last three sections: the shared framework of the logic of ideas offers a perspective that helps to appreciate both the resemblances and the differences between these thinkers. The similarities include a subject-oriented approach, following from the importance of our mental faculties in the perception, division and compounding of ideas in general; the crucial role played by clarity and distinctness in the first stage of a two-stage logic; the presence of two methods in both philosophers; and the content of their first method, i.e. that of demonstrative deduction. Differences pertain to their precise views on clarity and distinctness; Descartes stresses clarity where Locke stresses distinctness. Moreover, the former uses clarity and distinctness as a criterion of truth, whereas for the latter clarity and distinctness is a necessary preliminary condition for truth, but not its criterion. Another difference pertains to their second method, i.e. their empiricist method; while Descartes's empiricism is hypothetical, Locke's empiricism is historical. The analysis of two methods in both philosophers—a rationalist and an empiricist method in the case of Descartes, and a deductive (if not a fully rationalist) and an empiricist method in the case of Locke—points to the continued relevance of the rationalist-empiricist distinction. While these concepts have turned out to be of limited use in making distinctions *between* early modern philosophers, the framework of the logic of ideas shows their usefulness in making methodological and epistemological distinctions *within* the views of Descartes and Locke.

Finally, given Descartes's importance in formulating the main elements of the new logic there is some plausibility in talking about a

[115] Locke, *Corr.* 2277, VI, p. 144.

'Cartesian logic'.[116] However, Descartes never brought these elements together under the name of 'logic'. He did not produce a systematic alternative to Aristotelian logic. Consequently, he never faced the problem of how to relate the content of the novel logic to the format or structure of conventional textbooks on logic. I shall now turn to the answers that were given to these structural problems by three of his successors: Arnauld, Malebranche and, again, Locke.

[116] See Gaukroger, *Cartesian Logic*, *passim*.

CHAPTER THREE

STRUCTURE OF THE NEW LOGIC

3.1. *Arnauld's Hybrid Logic*

La logique ou l'art de penser (1662), or *Logique de Port-Royal*, occupies in many ways an intermediary position between the logic of ideas and its Aristotelian predecessors. It was written by Antoine Arnauld (1612–1694) and several collaborators, including Pierre Nicole (1625–1695).[1] The *Logique* proved to be a very successful work and it was frequently reprinted right from its first appearance in 1662. The author used these reprints to answer his critics by numerous additions and changes, generally resulting in a softening of the bolder statements in the first edition.[2] I have used the text established by Clair and Girbal, which is based on the fifth edition of 1683.

The *Logique* is divided into four parts:

I. Containing reflections on ideas, or the first action of the mind, which is called conceiving.
II. Containing reflections people have made about their judgements.
III. On Reasoning
IV. On Method[3]

The subject matter of the first three parts coincides roughly with each of the three parts of the logic as treated in Aristotelian textbooks. However, some significant developments can be detected. In the case of Sanderson, the three main levels of logic were compared to three operations of the mind, without any consequences for the content

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[1] For Arnauld as main author of the *Logique*, see Kennedy, 'The Alliance between Puritanism and Cartesian Logic at Harvard', p. 553, note 16.

[2] Von Freytag Löringhoff, 'Préface' to Arnauld, *Logique* (ed. von Freytag Löringhoff) I, p. vii.

[3] Arnauld, *Logique*: 'I. Contenant les reflexions sur les idées, ou sur la premiere action de l'esprit, qui s'appelle concevoir', 'II. Contentenant les reflexions que les hommes on faites sur leur jugemens', 'III. Du Raisonnement' and 'IV. De la Methode'. Transl. Buroker.

of the three corresponding books or parts. The *Logique* on the other hand, while maintaining the format and much of the content of an Aristotelian textbook, makes much larger strides towards a 'facultative' logic. The titles of the four books point to as many operations of the mind: conceiving, judging, reasoning and ordering. A novel orientation is already announced by the subtitle of the work itself: *l'art de penser*. Logic is no longer primarily the science of syllogisms, but an art that is supposed to develop our mind by means of a better understanding of itself. The aim of logic should not consist in teaching us technical tricks, 'but in reflecting on what nature makes us do',[4] i.e. on what we are already capable of without a prior immersion in Aristotelian logic. Mental activities can be performed as well, and sometimes even better, by those who have not learnt a single rule of logic.[5] The reflections that Arnauld proposes instead, enable us 'by the natural light of reason alone', to discover and understand errors and faults in our understanding.[6]

The first activity of the mind is that of conceiving, and the *Logique* contains a revolutionary substitution of words by Cartesian ideas as the basic elements of logic within the format of a logical textbook, immediately at the start of part I: 'As we can have no knowledge of what is outside us except by means of the ideas in us, the reflections we can make on our ideas are perhaps the most important part of logic, since they are the foundation of everything else.'[7] In part I, which deals with the first activiy of the mind, viz. the act of conceiving, ideas are considered in five ways.

Firstly, Arnauld starts with a chapter on the nature and origin of ideas. According to Arnauld, the word 'idea' is so basic that it cannot be explained by other words that are clearer and simpler. However, we should prevent the kind of mistakes that arise when the word 'idea' is limited to images of corporeal things, which are based on mere sensory perception: 'we cannot reflect on what happens in

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[4] Arnauld, *Logique*, p. 38: 'Ainsi cet art ne consiste pas à trouver le moyen de faire ces operations, puisque la nature seule nous le fournit en nous donnant la raison: mais à faire des reflexions sur ce que la nature nous fait faire'. Transl. Buroker, p. 23.

[5] Arnauld, *Logique*, p. 38.

[6] *Ibid.* p. 38: 'Car il arrive souvent que l'on découvre par la seule lumiere naturelle qu'un raisonnement est faux'. Transl. Buroker, p. 23.

[7] Arnauld, *Logique*, I, p. 39: 'Comme nous ne pouvons avoir aucune connoissance de ce qui est hors de nous que par l'entremise des idées qui sont en nous, les reflexions que l'on peut faire sur nos idées, sont peut-être ce qu'il y a de plus important dans la Logique, parce que c'est le fondement de tout le reste.' Transl. Buroker, p. 25.

the mind without recognizing that we conceive a great number of things without any such images, and without becoming aware of the difference between imagination and pure intellection'.[8] We are able to conceive clearly our own thinking, or the words 'yes' and 'no', without any corresponding corporeal image. Consequently, Arnauld turns against the peripatetic dictum *Nihil est in intellectu quod non prius fuerit in sensu.* According to him, nothing is more clearer that the Cartesian *Je pense, Donc je suis*; and the ideas of being and of thinking do not draw their origins from any sensory perception at all.

Secondly, ideas can be considered according to the differences between the objects they represent. Arnauld gives a discussion of ideas of substances and ideas of their accidents that is based on the ten categories of Aristotle, but he does not forget to add: 'These are Aristotle's ten categories of which so much mystery is made, although to tell the truth, in themselves they are fairly useless'.[9] Arnauld proposes an alternative division, in which due weight is given to the central role of ideas. Ideas can either be taken directly from things, such as the idea of the earth or of the sun, or from signs which on their turn refer to things, such as the idea of a map or of a painting. In the latter case, 'the sign includes two ideas, one of the thing which represents, the other of the thing represented. Its nature consists in prompting the second by the first'.[10]

Thirdly, ideas can be considered according to their composition or simplicity. Given the limits of our understanding we are not able to gain a complete understanding of most composed things. We can try, however, to understand certain parts that are isolated from the other parts of the composed thing; this is abstraction.

Fourthly, ideas can be general, particular or singular; this reflection prompts Arnauld to a discussion of the five Aristotelian universals or predicables: genera, species, *differentia*, *propria* and accidents.

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[8] Arnauld, *Logique*, I. i, p. 40: 'Au-lieu qu'on ne peut faire reflexion sur ce qui se passe dans notre esprit, qu'on ne reconnoisse que nous concevons un très-grand nombre de choses sans aucune de ces images, & qu'on ne s'apperçoive de la difference qu'il y a entre l'imagination & la pure intellection.' Transl. Buroker, p. 25.

[9] Arnauld, *Logique*, I. iii, p. 51: 'Voilà les X. Categories d'Aristote dont ont fait tant de mysteres, quoiqu'a dire le vrai ce soit une chose de soi très peu utile, & qui non seulement ne sert gueres à former le jugement, ce qui est le but de la vraie Logique, mais qui souvent nuit beaucoup'. Transl. Buroker, pp. 33–34.

[10] Arnauld, *Logique*, I. iv, p. 53: 'le signe enferme deux idées, l'une de la chose qui représente, l'autre de la chose représentée; & sa nature consiste à exciter la seconde par la premiere.' Transl. Buroker, p. 35.

However, his discussion ends with as much criticism as does his treatment of the ten categories; 'This is more than anyone needs to know about the five universals treated so extensively in the Schools. Knowing that there are genera, species, differences, properties, and accidents is not very useful.'[11]

The fifth and, in the present context, most interesting way in which Arnauld considers ideas, is according to their clarity and distinctness, and their obscurity and confusion. He first states that ideas can be clear without being distinct. This point about distinctness being a stricter notion than clarity had already been made by Descartes in his definition of these concepts (see above, §2.4). However, Arnauld continues with the opaque assertion that the clarity of ideas is in fact identical to the distinctness of ideas:

> Nevertheless we can say that all ideas are distinct in so far as they are clear, and that their obscurity derives only from their confusion, just as in pain the single sensation which strikes us is clear and also distinct. But what is confused, namely that the sensation is in the hand, is by no means clear to us.[12]

Although Arnauld starts his discussion of clarity and distinctness as a property of ideas, elsewhere he adds that propositions can possess this property as well. For instance, he gives rules for axioms, 'that is, propositions which are clear and evident in themselves'[13]. So, like Descartes, he does not defend a two-stage logic of ideas in the narrow sense, but, again like Descartes (see above, §2.4), he subscribes to a two-stage model to the extent that he makes a distinction between clarity and distinctness (whether of ideas or of propositions) as a preliminary condition for subsequent reasoning. For instance, he approvingly mentions geometers who take care 'to base their reasoning only on clear and evident principles'.[14] As a good adherent

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[11] Arnauld, *Logique*, I. vii, p. 64: 'En voilà plus qu'il n'en faut touchant les cinq Universaux qu'on traite dans l'école avec tant d'étendue. Car il sert de très-peu de savoir qu'il y a des Genres, des Especes, des Differences, des Propres, & des Accidens'. Transl. Buroker, p. 44.

[12] Arnauld, *Logique*, I. ix, p. 70: 'Neanmoins on peut dire que toute idée est distincte entant que claire, & que leur obscurité ne vient que de leur confusion, comme dans la douleur le seul sentiment qui nous frappe est clair, & est distinct aussi; mais ce qui est confus, qui est que ce sentiment soit dans notre main, ne nous est point clair.' Transl. Buroker, p. 48.

[13] Arnauld, *Logique*, IV. vi, p. 315: 'c'est à dire les propositions claires & évidentes par elles-mêmes' (title of chapter). Transl. Buroker, p. 246.

[14] Arnauld, *Logique*, IV. iii, p. 307: 'de *n'établir leurs raisonnemens que sur des principes clairs & évidens*'. Transl. Buroker, p. 239.

of the new logic he is more interested in errors of the first type than in errors of the second type (concerning subsequent reasoning): 'The majority of people's errors ... depend more on reasoning based on false principles, than from reasoning incorrectly from their principles'.[15]

Arnauld's discussion of the errors that are relevant for the logic of ideas is preceded by a chapter on the errors that pertain to the old logic, entitled 'Different ways of reasoning badly, which are called sophisms'.[16] This chapter contains much that can be traced back to Aristotle's *Sophistical refutations.* Arnauld is not very interested in the subject. He does not bother to discuss the full Aristotelian catalogue of sophistical errors, 'since some are so obvious that they are not worth mentioning'.[17] By contrast, he pays generous attention to the errors that are relevant to the logic of ideas, especially errors of the first type. Arnauld follows Descartes by mentioning ideas of sensible qualities (colours, sounds, smells, and appetite, thirst and pain) as the main examples of obscure and confused ideas.[18] Arnauld is a Cartesian rationalist in so far as he assumes that the things we know 'by the mind' (*par l'esprit*) are more certain than the things we know by our senses.[19] Arnauld inveighs against philosophers who think that they can prove the truth of axioms by way of induction, since induction cannot give us complete certainty of any truth. Induction is linked to the multitude of experiences that we have made since childhood. Arnauld points out, however, that 'nothing is more capable of leading us into error than limiting ourselves to these childhood prejudices'.[20] Certainty about the proposition that the whole is greater than its part is not based on experience, but 'depends solely on the fact that our clear and distinct idea of a whole and a part clearly imply both that the whole is greater than its part, and that the part is smaller than the whole'.[21]

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[15] Arnauld, *Logique,* III, p. 177: 'La plûpart des erreurs des hommes ... viennent bien plus de ce qu'ils raisonnent sur de faux principes, que non pas de ce qu'ils raisonnent mal suivant leurs principes.' Transl. Buroker, 135.

[16] Arnauld, *Logique,* III. xix, p. 241: 'Des diverses manières de mal raisonner, que l'on appelle sophismes'. Transl. Buroker, p. 189.

[17] Arnauld, *Logique,* III. xix, p. 242: 'y en ayant quelques-uns de si grossiers qu'ils ne meritent pas d'être remarques'. Transl. Buroker, p. 189.

[18] Arnauld, *Logique,* I. ix, p. 71.

[19] *Ibid.* IV. i, 291 (title of chapter). Transl. Buroker, p. 227.

[20] Arnauld, *Logique,* IV. vi, p. 317: 'il n'y a rien de plus capable de nous entretenir dans l'erreur, que de nous arrêter à ces préjugés de notre enfance'. Transl. Buroker, p. 247.

[21] Arnauld, *Logique,* IV. vi, p. 317: 'Mais elle dépend uniquement de ce que les idées

The second and third parts of the *Logique*, on judgement and on syllogisms, are in accordance with conventional works on logic, except for an—admittedly very nominal—incorporation of the subject of ideas. We have seen that the basic unit of Aristotelian logic consists of terms, i.e. words, which can be combined into propositions, which in turn can be used to form syllogisms. By contrast, Arnauld starts his discussion of judgements by taking ideas rather than words as basic elements: 'After conceiving things by our ideas, we compare these ideas and, finding that some belong together and others do not, we unite or separate them. This is called *affirming* or *denying*, and in general *judging*.'[22] At the start of part III, on syllogisms, he briefly mentions ideas again. He equals the search for syllogistic middle terms (see above, §2.2) with the search for intermediate ideas in the logic of ideas (see above, §2.1). Shortly after he has mentioned intermediate ideas he writes: 'Thus whenever the mere consideration of these two ideas is not sufficient for deciding whether we ought to affirm or deny one idea of the other, the mind has to have recourse to a third idea ... This idea is called *middle* [idea].'[23] However, he then switches back from Cartesian ideas to Aristotelian terms: 'Thus it is necessary to compare this middle term with the subject or the minor term as well as the attribute or the major term.'[24] Arnauld does not provide arguments for the identification of intermediate ideas with middle terms. In any case, ideas do not really influence the content of the parts on judgement or syllogisms. Ideas are mentioned at the start of both parts, but for the rest of these parts Arnauld reverts to Aristotelian terminology and subject matter. The subjects and predicates that are discussed in these parts could just as well consist of terms as of ideas.

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claires & distinctes que nous avons d'un tout & d'une partie enferment clairement, & que le tout est plus grand que la partie, & que la partie est plus petite que le tout.' Transl. Buroker, p. 247.

[22] Arnauld, *Logique*, II. iii, p. 113: 'Après avoir conçû les choses par nos idées, nous comparons ces idées ensemble, & trouvant que les unes conviennent entr'elles & que les autres ne conviennent pas, nous les lions ou délions, ce qui s'appelle *affirmir* ou *nier*, & generalement *juger*.' Transl. Buroker, p. 182.

[23] Arnauld, *Logique*, III. i, p. 178: 'Lors donc que la seule consideration de ces deux idées ne suffit pas pour faire juger si l'on doit affirmer ou nier l'une de l'autre, il a besoin de recourir à une troisiéme idée ... & cette troisiéme idée s'appelle *moyen*.' Transl. Buroker, p. 135, who, however (in my view incorrectly), translates '*moyen*' with 'middle term'.

[24] Arnauld, *Logique*, III. i, p. 179: 'Il faut donc que ce terme moyen soit comparé tant avec le sujet ou le petit terme, qu'avec l'attribut ou le grand terme.' Transl. Buroker, p. 136.

The fourth part of the *Logique* contains a—largely Cartesian—discussion of rationalist method. Whereas the topic of method had been discussed only summarily by Sanderson after the third part of his logic, it is deemed important enough by Arnauld to give it a separate part. Arnauld presents method as a natural sequel to the triad word/idea—proposition—syllogism. A syllogism forms one *raisonnement*, and method is concerned with demonstration, which consists of various *raisonnements*. The Port-Royal decision to include a fourth part on method is in line with a trend that is present in other seventeenth-century texts, in which the methodological interests of Ramus and Zabarella (see §2.2) makes itself felt in varying degrees.[25] A similar pattern was followed by Thomas Hobbes in the 'Logica' of his *De Corpore* (1655)[26] and by Pierre Gassendi in his *Institutio Logica in Quatuor Partes Distributa* (1658).[27]

Arnauld's concept of method is heavily influenced by the paradigmatic role given to mathematics by Descartes and also by Blaise Pascal.[28] Arnauld was well versed in mathematics and amongst his many publications there are a long treatise on geometry, *Nouveaux éléments de géometrie, contenant des moyens de faire voir quelle lignes sont incommensurables*,[29] and a shorter essay on magic squares.[30] In the *Logique*, however, the role of mathematics is of a more general pedagogic nature. The capacity of our mind should be developed by slowly accustoming it to mathematics and other things that are difficult.[31] Mathematics is not the only device by which we can sharpen our

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[25] Cf. Dear, 'Method and the Study of Nature', pp. 147–150.

[26] Hobbes, *De Corpore*: '1. De Philosophia', '2. De Vocabulis', '3. De Propositione', '4. De Syllogismo', '5. De erratione, Falsitate, & Captionibus' and '6. De Methodo'.

[27] Gassendi, *Institutio*: 'I. De Simplici Imaginatione', 'II. De Propositione', 'III. De Syllogismo' and 'IV. De Methodo'.

[28] See Arnauld, *Logique*, 'Premier Discours', p. 21: 'On est obligé neanmoins de reconnoître que ces reflexions qu'on appelle nouvelles, parcequ'on ne les voit pas dans les Logiques communes, ne sont pas toutes de celui qui a travaillé à cet ouvrage, & qu'il en a emprunté quelques-unes des livres d'un celebre philosophe de ce siecle, qui a autant de netteté d'esprit qu'on trouve de confusion dans les autres. On en a aussi tiré quelques autres d'un petit écrit non emprimé, qui avoit été fait par feu Monsieur Pascal, & qu'il avoit intitulé, *De l'esprit Geometrique*'.

[29] Arnauld, *Nouveaux éléments*, in: Arnauld, *Œuvres*, vol. XLII, pp. 1–342.

[30] 'Solution d'un des plus célebres et des plus difficiles problèmes d'arithmatique', in: Arnauld, *Œuvres*, vol. XLII, pp. 343–356.

[31] Arnauld, *Logique*, 'Premier Discours', pp. 22–23: 'La capacité de l'esprit s'étend & se resserre par accoûtumance, & c'est à quoi servent principalement les Mathematiques, & generalement toutes les choses difficiles, comme celles dont nous parlons. Car elles donnent une certaine étendue à l'esprit, & elles l'exercent à s'appliquer davantage, & à se tenir plus ferme dans ce qu'il connoît.'

minds; although Arnauld does not think that syllogisms are helpful in discovering new truths, he nevertheless admits that 'they are always useful for exercising the mind'.[32] We have encountered this shared instrumental role of both mathematics and syllogisms already as a feature of Aristotelian logic in the seventeenth century (see above, §2.2).

Arnauld's definition of method recalls Ramus' conception of method as order: 'The art of arranging a series of thoughts properly, either for discovering the truth when we do not know it, or for proving to others what we already know, can generally be called method.'[33] The distinction between the discovery of new truths and the exposition of truths that are already known fits the Zabarellian distinction between the analytic and the synthetic methods (see above, §2.2). For the method of analysis Arnauld quotes Descartes's four 'geometrical' rules as given in the *Discours* (see above §2.5).[34] These rules are repeated almost verbally, except that Arnauld replaces the expression 'clear and distinct' in the first rule by 'clear' only (which is not surprising, since he considers 'clear' and 'distinct' to have the same meaning). Arnauld also adds, very sensibly, that Descartes's rules are so general that they are hardly specific for the analytical method.

For the method of synthesis, Arnauld give five rules; rules one and two pertain to definitions, rule three to axioms and rules four and five to demonstrations:

1. Leave no term even slightly obscure or equivocal without defining it.
2. Use in definitions only terms that are perfectly known or already explained.
3. Require in axioms only things that are perfectly evident.
4. Prove all slightly obscure propositions, using in the proof only preceding definitions, axioms that have been granted, propositions that have already been demonstrated, or the construction of the thing itself that is in question whenever there is some operation to be done.
5. Never take advantage of the equivocation in terms by failing to substitute mentally the definitions that restrict and explain them.[35]

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[32] *Ibid.* III, p. 178: 'elles serviroient toûjours à exercer l'esprit'. Transl. Buroker, p. 135.

[33] Arnauld, *Logique*, IV. ii, p. 299: 'On peut appeller generalement methode, l'art de bien disposer une suite de plusieurs pensées, ou pour découvrir la verité quand nous l'ignorons, ou pour la prouver aux autres quand nous la connoissons déja.' Transl. Buroker, 233.

[34] Arnauld, *Logique*, IV. ii, p. 306.

[35] *Ibid.* IV. iii, pp. 307–308: '1. Ne laisser aucun des termes un peu obscurs ou équivoques sans le définir', '2. N'employer dans les définitions que des termes parfaitement connus, ou déja expliqués', '3. Ne demander en axiomes que des choses

However, Arnauld is concerned to widen the scope of both analysis and synthesis. He stresses that analysis 'consists more in judgement and mental skill than in particular rules'.[36] And he points out that the five rules of synthesis help us 'to avoid making faulty inferences when we are treating scientific matters, which is doubtless the main point, since everything else may be called useful rather than necessary'.[37] Consequently, he tries to give rules for the sciences in general. To this aim, he repeats the five rules of synthesis and then makes several additions. First, he adds another rule for axioms:

> Accept as evident what needs only a little attention to be recognized as true.[38]

Second, he adds two general rules for method:

> Treat things as much as possible in their natural order, beginning with the most general and the simplest, and explaining everything belonging to the nature of the genus before proceeding to particular species.
>
> Divide each genus as much as possible into all its species, each whole into all its parts, and each difficulty into all its cases.[39]

The five synthetical rules and the additional rule for axioms are taken from Pascal's 'De l'esprit géométrique', and the two rules on method are based on Descartes *Regulæ* and on the second of his four rules as given in the *Discours* respectively.[40]

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parfaitement évidentes', '4. Prouver toutes les propositions un peu obscures, en n'employant à leur preuve que les définitions qui auront précedé, ou les axiomes qui auront été accordés, ou les propositions qui auront déja été démontrées, ou la construction de la chose même dont il s'agira, lorsqu'il y aura quelque operation à faire' and '5. N'abuser jamais de l'équivoque des termes, en manquant d'y substituer mentalement les définitions qui les restreignent, & qui les expliquent'. Transl. Buroker, p. 240.

[36] Arnauld, Logique, IV. ii, 305: 'Voilà ce qu'on peut dire generalement de l'analyse, qui consiste plus dans le jugement & dans l'adresse de l'esprit, que dans des regles particulieres.' Transl. Buroker, p. 238.

[37] Arnauld, *Logique*, IV. iii, p. 308: 'éviter de faire de faux raissonnemens, en traitant les sciences, ce qui sans doute est le principal, tout le reste se pouvant dire utile plutôt que necessaire'. Transl. Buroker, p. 240.

[38] Arnauld, *Logique*, IV. xi, p. 334: 'Recevoir pour évident ce qui n'a besoin que d'un peu d'attention pour être reconnu veritable.' Transl. Buroker, p. 259.

[39] Arnauld, *Logique*, IV. xi, p. 334: 'Traiter les choses, autant qu'il se peut, dans leur ordre naturel, en commençant par les plus generales & les plus simples, & expliquant tout ce qui appartient à la nature du genre, avant que de passer aux especes particulieres' and 'Diviser, autant qu'il se peut, chaque genre en toutes ses espaces, chaque tout en toutes ses parties, & chaque difficulté en tous ces cas.' Transl. Buroker, p. 259.

[40] See Arnauld, *Logique*, p. 414, notes 415–416. For the relation between the

Arnauld's substitution of terms by ideas in part I and his largely Cartesian methodology in part IV on the one hand, and the largely conventional treatment of propositions in part II and syllogisms in part III on the other, give the *Logique* a hybrid character. Yet it is clear that his predilections go in the direction of the more novel elements of his logic. When comparing the fourth part of the *Logique* with the third part he states that it is more important to order our thoughts than to know the rules of syllogism.[41] In the 'Premier Discours' to the *Logique* he also gives a place of honour to the fourth part, when he admits that in this part he has included subjects that he might have discussed in the second or third parts as well:

> But we did this on purpose because we thought it useful to see everything required for perfecting knowledge in one place, which is the main point of the work on method treated in Part IV. This is why we reserved the discussion of axioms and demonstrations for that section.[42]

While Arnauld is so mild as to give here, in the fifth edition, only a practical reason for the weight given to the fourth part, his motivation for this predilection on the parallel place in the first edition (which has only one 'Discours') had been more drastic and coloured by doubt about an essential structural feature of Aristotelian textbooks on logic:

> But we did this on purpose, as much because we thought it useful to see everything required for perfecting knowledge in one place, as because we thought that there would be many persons who could be satisfied with the first and last parts of this work, since there are few things in the other two parts that good sense could not supply, without having to make a special study of them.[43]

Logique and the *Regulæ*, see above, § 2.3, note 64.

[41] *Ibid.* IV, p. 291: 'il sert de peu pour bien démontrer, de savoir les regles des syllogismes, qui est à quoi on manque très-peu souvent; mais que le tout est de bien arranger ses pensées, en se servant de celles qui sont claires & évidentes, pour penetrer dans ce qui paroissoit plus caché.'

[42] *Ibid.* p. 25: 'Mais on l'a fait à dessein, parcequ'on a jugé qu'il estoit utile de voir en un même lieu tout ce qui étoit necessaire pour rendre une science parfaite, ce qui est le plus grand ouvrage de la methode dont on traite dans la quatriéme partie. Et c'est pour cette raison qu'on a reservé de parler en ce lieu-là des axiomes, et des démonstrations.' Transl. Buroker, p. 13.

[43] Arnauld, *Logique* (ed. von Freytag Löringhoff), 'Discours', p. 22: 'Mais on l'a fait à dessein, tant parce qu'on a jugé qu'il estoit vtile de voir en vn mesme lieu tout ce qui estoit necessaire pour rendre vne science parfaite, que parce qu'on a crû qu'il auroit beaucoup de personnes qui se pouvoient contenter de la premiere & de la derniere partie de cét Ouvrage, y ayant peu de choses dans les deux autres que le

This is an ominous remark indeed. While Aristotelian logicians had structured their textbooks in at least three parts (terms—propositions—syllogisms), which could be followed by some remarks on method, we see Arnauld drawing structural conclusions from the content of a new logic of ideas that consists of only two stages that consequently can be discussed in two parts: one about individual ideas (part I of his *Logique*) and another about *raisonnements* that are based on these ideas (part IV). However, he maintains the more conventional parts on judgements and syllogism along with the novel parts on ideas and method. We shall now proceed with two successors who were less patient with the Aristotelian tradition.

3.2. *Malebranche's 'Facultative' Logic*

Père Nicolas Malebranche's (1638–1715) *Recherche de la vérité où l'on traite de la nature de l'esprit de l'homme et de l'usage qu'il en doit faire pour éviter l'erreur dans les sciences* (1674–1675) opens with the following grand statement:

> Error is the cause of men's misery; it is the sinister principle that has produced the evil in the world; it generates and maintains in our soul all the evils that afflict us, and we may hope for sound and genuine happiness only by seriously laboring to avoid it.[44]

The scope and sophistication of Malebranche's taxonomy of error is unsurpassed by any other seventeenth-century text, including Bacon's *Novum organum* with its four *idola mentis* and including previous discussions by Arnauld (see above) and subsequent discussions by Locke (see §2.1). Error is a central theme in seventeenth-century epistemology; the topic was often occasioned by sceptical questions about the reliability of the human faculties. Error was also closely linked to method, in the sense that the former contained problems to which the latter was supposed to provide answers. Malebranche's discussion of error contains all the elements that are typical of the logic of ideas (ideas, faculties and method), but he is interested es-

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bon sens ne puisse suppleer, sans avoir besoin d'en faire vne estude particuliere'. Transl. Buroker, p. 13, note c.

[44] Malebranche, *Recherche*, I. i, vol. I, p. 39: 'L'erreur est la cause de la misere des hommes; c'est le mauvais principe qui a produit le mal dans le monde; c'est elle qui fait naître & qui entretient dans nôtre ame tous les maux qui nous affligent, et nous ne devons point esperer de bonheur solide & veritable, qu'en travaillant serieusement à l'éviter.' Transl. Lennon, p. 1.

pecially in the faculties, and he has the audacity to draw far-reaching structural consequences from this predilection. Whereas Arnauld had still discussed the new logic within the cumbersome structure of an Aristotelian textbook, Malebranche makes a radical break with the past by choosing a structure which is in complete accordance with one of the three main elements of the logic of ideas, i.e. the faculties. For Malebranche, an analysis of error implies first of all an analysis of the faculties that can cause error. He distinguishes two main faculties: the understanding and the will. Our senses, imagination and mind (or pure understanding) belong to the understanding, while our inclinations and passions belong to the will. He devotes the first three of six books of the *Recherche* to the errors of the faculties of the senses, imagination and pure understanding, followed by a fourth book on the errors caused by the inclinations and a fifth book on the errors provoked by our passions. The sixth and last book, on method, contains an answer to the question of how we can combat error. Thanks to the new structure of the *Recherche*, Malebranche can concentrate on the novel elements of the his logic and completely circumvent verbal propositions and syllogisms, which had still been discussed—with hardly disguised aversion—in the logic of Arnauld.

Although Malebranche does not define and systematically analyse ideas until the start of the third book of the *Recherche*, on pure understanding, ideas play a pivotal role in his discussion of the faculties. His protracted and acerbic polemic with Arnauld on the precise nature of ideas between 1683 and 1694 only confirms his interest in the subject.[45] The importance of ideas lies in the fact that we can see no external object by itself but only through the idea we have of it; 'Thus, by the word *idea*, I mean here nothing other than the immediate object, or the object closest to the mind, when it perceives something, i.e., that which affects and modifies the mind with the perception it has of an object.'[46] Malebranche's philosophy is Cartesian in many regards. Whereas Descartes (and Arnauld as well), however, had used the clarity and distinctness of perceptions in relation to both ideas and propositions, Malebranche, like Locke after him, uses 'clear and distinct' more exclusively in relation to

[45] See Moreau, 'The Malebranche-Arnauld Debate', *passim.*

[46] Malebranche, *Recherche*, III. II. i, vol. I, p. 414: 'Ainsi par ce mot *idée*, je n'entends ici autre chose, que ce qui est l'object immédiat, ou le plus proche de l'esprit, quand il apperçoit quelque object, c'est-à-dire ce qui touche & modifie l'esprit de la perception qu'il a d'un objet.' Transl. Lennon, p. 217.

ideas. Consequently, when he uses clarity and distinctness to mark the first stage in a two stage logic of ideas, this use pertains more to the narrow sense of clear and distinct *ideas*, than in the broader Cartesian sense of clear and distinct *perceptions* (see above, §2.4). With regard to the first stage he writes that 'it is absolutely necessary to observe exactly the rule we have just prescribed, and to study which ideas are the clear and distinct ideas of things, in order to reason only according to these ideas'.[47] With respect to the second stage, i.e. the activity of reasoning, he stresses that we should look for intermediate ideas that should all be clear and distinct.[48]

Since, in the early modern era, specific epistemological views tend to stress specific human faculties, Malebranche's division of the *Recherche* according to our faculties leaves him well poised to express his epistemology. His way of discussing clarity and distinctness leaves no doubt as to his rationalist and anti-empiricist views. Nothing hinders us more in our attention to clear and distinct ideas than the senses.[49] Malebranche's anti-empiricism has a clearly anti-Aristotelian thrust; Aristotle 'nearly always reasons only on the confused ideas received through the senses and on other vague, general, and indeterminate ideas that represent nothing in particular to the mind.'[50]

Malebranche contrasts the confused sensations and emotions of the soul with pure understanding, which provides us with all our clear and distinct ideas, even those of material objects. In his anti-empiricism Malebranche goes beyond Descartes. While the latter had made cautionary remarks about the possibility of material falsity in sensory ideas (see above, §2.4), the former denies that our senses provide us with any idea about external objects. The 'confused ideas' that Malebranche criticized in Aristotle are really not ideas at all. The

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[47] Malebranche, *Recherche*, VI. II. iv, vol. II, p. 321: 'il est absolument nécessaire d'observer exactement la regle que nous venons de prescrire, & d'examiner quelles sont les idées claires & distinctes des choses, afin de ne raisonner que suivant ces idées'. Transl. Lennon, p. 453.

[48] Malebranche, *Recherche*, VI. II. i, vol. II, p. 296 (see below, second methodological rule).

[49] *Ibid.* I. xviii, vol. I, pp. 176–177: 'Or il est certain, que rien ne nous détourne davantage de l'attention aux idées claires & distinctes, que nos propres sens; & par conséquent rien ne nous éloigne davantage de la vérité, & ne nous jette si-tôt dans l'erreur.'

[50] *Ibid.* II. II. ii, vol. II, p. 300: 'Aristote ... ne raisonne presque jamais que sur les idées confuses que l'on reçoit par les sens, & que sur d'autres idées vagues, générales, & indéterminées, qui ne representent rien de particulier à l'esprit'. Transl. Lennon, p. 440.

fact that we can have sensations and the fact that we have ideas of external objects does not imply that there is a causal relation between these sensations and our ideas. When Malebranche embarks on the origin of our ideas of external objects, he writes:

> either [a] the ideas we have of bodies and of all objects we do not perceive by themselves come from these bodies or objects; or [b] our soul has the power of producing these ideas; or [c] God has produced them in us while creating the soul or produces them every time we think about a given object; or [d] the soul has in itself all the perfections it sees in bodies; or else [e] the soul is joined to a completely perfect being that contains all intelligible perfections, or all the ideas of created beings.[51]

Malebranche rejects the first four possibilities, including the empiricist option (a), and chooses for (e), which is his famous thesis that we see all things in God. Seeing all things in God means seeing the *ideas* of all external objects in God; this is not an activity of the senses, but of pure understanding. Malebranche's epistemology is rationalistic in that reason is supposed to be able to provide us with knowledge about matters of fact. The ideas on which this knowledge is based are ultimately derived not from our own minds but from God's mind. Since the perception of ideas (including the ideas of external objects) is so intimately related with the faculty of pure understanding, it is not surprising that a systematic definition and discussion of ideas has to wait until the start of book III, where this faculty is analysed.

Ideas do not only figure in Malebranche's first five books on the faculties, but also in his extensive discussion of method in book VI, which is divided in two parts. The first part is of a preliminary nature and revolves around attention. In the same way as our eyes need light in order to see, so our minds need ideas in order to think. Thanks to God's firm and immutable will 'we shall always have ideas to discover things that are naturally subjects for reason'.[52] In practice,

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[51] Malebranche, *Recherche*, III. II. i, vol. I, p. 417: 'qu'il est absolument nécessaire, que les idées que nous avons des corps, & de tous les autres objets que nous n'appercevons point par eux-mêmes, viennent de ces même corps, ou de ces objets: ou bien que nôtre ame ait la puissance de produire ces idées: ou que Dieu les ait produites avec elle en la créant, ou qu'il les produise toutes les fois qu'on pense à quelque object: ou que l'ame ait en elle-même toutes les perfections qu'elle voit dans ces corps: ou enfin qu'elle soit unie avec un être tout parfait, & qui renferme généralement toutes les perfections intelligibles, ou toutes les idées des êtres créez.' Transl. Lennon, p. 219.

[52] Malebranche, *Recherche*, VI. I. i, vol. II, p. 247: 'elle ne nous manque jamais pour découvrir les choses qui sont naturellement sujettes à la raison'. Transl. Lennon, p. 410.

however, we do not see before us all ideas with the same intensity. This intensity depends on our attention. Nothing helps us better in avoiding obscurity and confusion and in furthering clarity and distinctness than an attentive mind.[53]

After his general discussion of attention in the first part, Malebranche treats 'the rules that absolutely must be observed in the resolution of all questions' in the second part of the book on method.[54] These rules again stress the importance of clear and of distinct ideas. First, Malebranche gives the following general principle, immediately followed by a general rule:

> The principle of all these rules is that *it is always necessary to keep our reasoning clear to discover the truth without fear of being mistaken.* On this principle depends the general rule regarding the subject of our studies, namely: *that we should reason only about things of which we have clear ideas*; and, as a necessary consequence of this, *that we should always begin with the simplest and easiest things, and pause there for a considerable time before undertaking the search after the most complex and difficult ones.*[55]

He then gives the following six, more specific rules:

1. *The state of the question we propose to resolve must be very distinctly conceived.* We must have sufficiently distinct ideas of our terms to be able to compare them, and thus to recognize the relations we seek among them.
2. *It is necessary through some effort of the mind to discover one or several intermediary ideas that can serve as a common measure for recognizing by their means the relationships between them.*
3. *The subject being considered must be carefully simplified in order to avoid examining things that are irrelevant to the discovery of the truth sought.*
4. *It is necessary to divide the subject of our meditation into parts and to consider them all one after the other according to natural order, beginning with the simplest, i.e., those that involve fewer relations, and never advancing to the more complex before having distinctly recognized the simplest and having become familiar with them.*

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[53] Malebranche, *Recherche*, VI. I. ii, vol. II, p. 250.

[54] Malebranche, *Recherche*, VI. II. i, vol. II, p. 295: '[les] règles qu'il est absolument nécessaire d'observer dans la résolution de toutes les questions.' Transl. Lennon, p. 437.

[55] Malebranche, *Recherche*, VI. II. i, vol. II, p. 296: 'Le principe de toutes ces régles est, qu'il faut toûjours conserver l'évidence dans ses raisonnemens, pour découvrir la vérité sans craindre de se tromper. De ce principe dépend cette régle générale qui regarde le sujet de nos études, sçavoir, que nous ne devon raisonner que sur des choses dont nous avons des idées claires: & par une suite nécessaire, que nous devons toûjours commencer par les choses les plus simples & les plus faciles, & nous y arrêter fort long-tems avant que d'entreprendre la recherche des plus composées & des plus difficiles.' Transl. Lennon, pp. 437–438.

5. *We should simplify their ideas* [i.e. the ideas of the parts of the subject of our meditation] *and afterward arrange them in our imagination or write them in our imagination or write them on paper so they will no longer occupy the entire capacity of the mind.*
6. *They* [our ideas] *must all be compared according to the rules of combination, alternately with one another, either by the mind's eye alone, or by the movement of the imagination together with the mind's eye, or by the calculation of the pen joined to the attention of the mind and imagination.*[56]

The general principle, the general rule and the six specific rules are all taken either directly from the four rules in Descartes's *Discours* (see above, §2.5) or indirectly (by means of Arnauld's *Logique*), from his *Regulæ*.[57]

Finally, before concluding our general discussion of the *Recherche*, we need to address the question whether this book is a work of logic at all. Malebranche does not explicitly call his work a logic. Yet his polemics against Aristotelianism points in the direction of logic. He attacks 'the ordinary sorts of logic [that] are more suited for diminishing rather than increasing the mind's capacity'.[58] It is clear that Malebranche here refers to Aristotelian logic. He also writes that 'Aristotle's logic is not very useful because it occupies the mind too much and diverts attention that it should have brought to bear

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[56] Malebranche, *Recherche*, VI. II. i, vol. II, pp. 296–298: 1. '*Qu'il faut concevoir tres-distinctement l'état de la question qu'on se propose de résoudre*, & avoir des idées de ses termes assez distinctes pour les pouvoir coomparer, & pour en reconnoître ainsi les rapports que l'on cherche', 2. '*Qu'il faut découvrir par quelque effort d'esprit une ou plusieurs idées moyennes, qui puissent servir comme de mesure commune pour reconnoître par leur moyen les rapports qui sont entre elles*', 3. '*Qu'il faut retrancher avec soin du sujet, que l'on doit considerer, toutes les choses qu'il n'est point nécessaire d'examiner pour découvrir la vérité que l'on cherche*', 4. '*Qu'il fait diviser le sujet de la méditation par parties, & les considérer toutes les unes aprés les autres selon l'ordre naturel, en commençent par les plus simples, c'est-à-dire par celles qui renferment moins de rapports: & ne passer jamais aux plus composées avant d'avoir reconnu distinctement les plus simples, & se les être rendu faimiliéres*', 5. '*Qu'on doit en abréger les idées, & les ranger ensuite dans son imagination, ou les écrire sur le papier, afin qu'elles ne remplissent plus la capacité de l'esprit*', and 6. '*Qu'il faut les comparer toutes selon les régles des combinaisons, alternativement les unes avec les autres, ou par la seule vûë de l'esprit ou par le mouvement de l'imagination accompagné de la vûë de l'esprit, ou par le calcul de la plume, joint à l'attention de l'esprit & de l'imagination*'. Transl. Lennon, pp. 437–438.

[57] See Malebranche, *Recherche*, vol. II, pp. 548–549, notes 144–150.

[58] Malebranche, *Recherche*, III. I. iii, vol. I, p. 402: 'De sorte que toute l'adresse qu'il y a pour le [l'esprit] rendre plus pénétrant & plus étendu, consiste comme nous l'expliquerons ailleurs, à bien ménager ses forces & sa capacité, ne l'emploïant pas mal à propos à des choses qui ne lui sont point nécessaires pour découvrir la vérité qu'il cherche: & c'est ce qu'il faut bien remarquer. Car cela seul fait bien voir que les Logiques ordinaires sont plus propres pour diminuer la capacité de l'esprit que pour l'augmenter'. Transl. Lennon, pp. 209–210.

upon the subjects it is examining'.[59] The simplicity and naturalness of his own Cartesian principles is contrasted favourably with the twisted reasonings of Aristotelian philosophers: 'that the clearest and simplest principles are the most fruitful, and that extraordinary and difficult things are not always as useful as our vain curiosity makes us believe'.[60] We can thus safely conclude that the *Recherche* is a logic in that it contains the main elements of the logic of ideas, and also in so far as it claims to provide an alternative to Aristotelian works on logic.

3.3. *Locke's Two-Stage Logic*

Whereas Malebranche completely broke with the conventional structure of logical textbooks by building the new logic around the human faculties, another strategy was intimated by Arnauld, who in the first edition of his *Logique* pointed out that for most readers the novel first part on ideas and the fourth part on method would be more interesting than the second part on propositions and the third part on syllogisms. This approach was brought to a conclusion by Locke—who, it should be added, was very well acquainted with the works of both Arnauld and Malebranche.[61] When Locke embarked on his

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[59] Malebranche, *Recherche*, VI. II. i, vol. II, p. 295: 'la Logique d'Aristote n'est pas de grand usage, à cause qu'elle occupe trop l'esprit, & qu'elle le détourne de l'attention qu'il devroit apporter aux sujet qu'il examine'. Transl. Lennon, p. 437.

[60] Malebranche, *Recherche*, VI. II. i, vol. II, p. 296: 'que les principes les plus clairs & les plus simples sont les plus féconds; & que les choses extraordinaires & difficiles ne sont pas toûjours aussi utiles, que nôtre vaine curiosité nous le fait croire'. Transl. Lennon, p. 437.

[61] For Locke and French philosophers, see Bonno, *Les relations intellectuelles de Locke*, pp. 225–226 and Rogers, 'The Writing of Locke's Essay' p. 13. During his second stay in France (1675–1679), Locke had read numerous French philosophers, including works by Arnauld and Nicole. In France he bought a copy of the *Logique*. See his journal of 1678, Bodleian Library, MS Locke f. 3, p. 178: 'L'Art de penser 12°'. In a list of Cartesian philosophers that he entered in this journal on 7 March 1678, he describes the *Logique* (in far from impeccable French) as 'un ouvrage les plus accompli qui ait encore paru en ce genre' (MS Locke, f. 3, p. 52). He had read the Latin translation of the *Logique* (see Harrison, *The Library of John Locke*, nr 1803a, p. 178) already in 1674 or 1675, before he went to France; see Bodleian Library, MS Locke, d. 1, fol. 49v; MS Locke, d. 9, p. 220; and MS Locke c. 1, p. 71 (I would like to thank John Milton for having drawn my attention to this fact). Concerning Malebranche, an entry in one of Locke's notebooks indicates that he bought the two volumes of the *Recherche* in March 1676 (MS Locke, f. 14, p. 15; later he bought other editions; see again Harrison, nrs 1875–1883a, pp. 182–183), but it is not until 1 March 1685 that some brief notes in his journal on the teaching of mathematics

'Historical, plain' inquiry into the human understanding in the *Essay*, he presents the following agenda:

> *First*, I shall enquire into the *Original* of those *Ideas*, Notions, or whatever else you please to call them, which a Man observes, and is conscious to himself he has in his Mind; and the ways whereby the Understanding comes to be furnished with them.
>
> *Secondly*, I shall endeavour to shew, what *Knowledge* the Understanding hath by those *Ideas*; and the Certainty, Evidence, and Extent of it.
>
> *Thirdly*, I shall make some Enquiry into the Nature and Grounds of *Faith*, or *Opinion*: whereby I mean that Assent, which we give to any Proposition as true, of whose Truth yet we have no certain Knowledge: And here we shall have Occasion to examine the Reasons and Degrees of *Assent*.[62]

These essential points were already given in much the same words in Drafts B and C for the *Essay* and are present in a more implicit way in Draft A.[63] The first point runs roughly parallel to the first stage of his logic of ideas. The second and the third points form the two main components of the second stage: certain knowledge and probable knowledge (see above, §2.1). Indeed, this two-stage division is reflected in a basically bipartite structure of the *Essay* itself. If this fundamental point has not received much attention in secondary literature,[64] this may be due to the simple fact that the *Essay* consists not of two but of four books:

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give clear proof of his actual reading of the work (MS Locke f. 8, p. 264). In 1693 he produced his critical *Examination of P. Malebranche's Opinion of Seeing All Things in God*, which eventually he decided not to publish, 'For I love not controversies, and have a personal kindness for the author' (Letter to Molyneux, 26 April 1695, Locke, *Corr.* 1887, V, pp. 352–353). There are no clear indications that during his years in France he ever met Malebranche (see Lough, *Locke's Travels in France*, p. xxxix); see however a letter from Nicolas Toinard to Locke, 18/28 March 1688, Locke, *Corr.* 1031, III, p. 417: 'Je n'oublieray pas à vous dire que l'un des exemplaires sera aussi donné au P.M.'

[62] *Essay*, I. i. 3, p. 44.

[63] Draft B: §3, Locke, *Drafts*, I, pp. 102–103; Draft C: 1.1. 1, fol. 3; Draft A abounds with discussions of the the first point (on individual ideas); on the second and third point (knowledge and opinion) see esp. Locke, *Drafts*, I, §32, p. 62: 'I shall come now haveing (as I thinke) found out the bounds of humane knowledg, in the next place to consider the severall degrees & grounds of Probability & Assent. or Faith.'

[64] See however, Martinak, *Zur Logik Lockes*, p. 3: 'Von dieser [Lockes Fassung des Begriffes der Logik] nun—dies sei vorausgeschickt—kann ich hier nur einen Theil bringen, (der etwa den I. Haupttheil einer Logik Lockes bilden würde),—die *Lehre von den Vorstellungen*. Einen II. Theil, enthaltend die Lehre vom Urtheil im weitesten Sinne, war ich vorläufig außer stande auszuarbeiten'; see also Kenney, 'John Locke and the Oxford Training', p. 88.

I. Of Innate Notions
II. Of Ideas
III. Of Words
IV. Of Knowledge and Opinion

However, in book II of the *Essay* Locke discusses all that is essential to stage one of his logic (by giving his analysis and taxonomy of separate ideas), while in book IV he examines the second stage (reasoning that is based on these ideas and that terminates in certain or probable knowledge). These two stages entail a simplification compared with the more elaborate structure of the reasoning process as described in Aristotelian textbooks. Here we first start with terms, which at a second level are combined into propositions which in their turn are combined into syllogisms; it is only at this third level that we reason and are able to draw conclusions. Locke's logic of ideas implies that in reasoning we can dispense with words, and also with verbal propositions and syllogisms. Reasoning is a process that is limited to ideas; '*Illation* or *Inference*'

> consists in nothing but the Perception of the connexion there is between the *Ideas*, in each step of the deduction, whereby the Mind comes to see, either the certain Agreement or Disagreement of any two *Ideas*, as in Demonstration, in which it arrives at Knowledge; or their probable connexion, on which it gives or with-holds its Assent, as in Opinion.[65]

The separate levels of verbal propositions and of syllogisms collapse into the second stage of the logic of ideas. If one were to take an Aristotelian work on logic, for instance Sanderson's *Compendium*, and replace its analysis of terms by that of ideas, omit the part on propositions entirely, and replace a discussion of demonstrative syllogisms and dialectical syllogisms by an analysis, based on ideas instead of words, of certain knowledge and probable knowledge respectively, one is left with a structure and content that correspond remarkably well with books II and IV of the *Essay*.[66] The main difference concerns method, not only in content but also in structure. We have seen separate sections being assigned to this topic at the end of both

[65] *Essay*, IV. xvii. 2, p. 669; cf. Locke, 'Of Study', p. 419.

[66] Moreover, just as Aristotle had continued his discussion of demonstrative (certain) and dialectical (probable) syllogisms with a discussion of contentious syllogisms, Locke followed his discussion of certain and probable knowledge in book IV of the *Essay* with a general analysis of those errors that are relevant for his logic of ideas; he gave this analysis not in the *Essay*, but in the 'Conduct', which was originally conceived as the penultimate chapter of the *Essay*; see Schuurman, 'Locke's Logic of Ideas', pp. 460–465. On the persistence of this pattern see also §8.7 below.

Aristotelian and non-Aristotelian textbooks. In the *Essay* its main discussion is also at the end, that is to say, in book IV; however, instead of dealing with one method at the very end of this book, Locke discusses his two methods (see above, §§ 2.1 and 2.5) at different places in book IV in their separate contexts of certain and probable knowledge.

So far on books II and IV—but what about books I and III? Book I contains Locke's polemic against innate ideas and the Cartesians are generally taken to be the principle target of this attack. However, this polemic could be accommodated within the wide framework of the logic of ideas. The new logic stressed the importance of the human faculties, but did not stipulate a hierarchy between them. While Descartes tended to stress the faculty of memory in his account of innate ideas, Locke turned to the faculty of sensory perception for his empiricist epistemology. The debate on innate ideas was possible within the new logic but was not essential for its outlines. There is some evidence that Locke himself agreed with this view. First, in Draft A he had started right away with the positive side of his views on the origin of our ideas: 'I imagin that all knowledg is founded on and ultimately derives its self from sense, or something analogous to it'.[67] Not until the last sections of this draft does it occur to him to discuss some arguments of those who attack this view and who believe in innate ideas instead.[68] Only from Draft B onwards does he turn the tables on his adversaries by switching from a defence against innatist attacks to the offensive and by placing this attack at the start of his treatise.[69] Not until Draft C do we see the discussion of innate knowledge being accorded the separate position of book I.

There is more that points to a relatively ephemeral position of book I in the structure of the *Essay*. Locke prepared an 'Epitome' of the *Essay* that would be translated into French by Jean le Clerc and published in 1688 (first as 'Extrait', later as *Abrégé*), more than a year before the first edition of the *Essay* itself.[70] In this 'Epitome' Locke decided to skip book I, declaring that it contained no more than a 'preliminary debate':

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[67] Locke, *Drafts*, I, § 1, p. 1.

[68] *Ibid.* §§43–45, pp. 74–82.

[69] *Ibid.* §§4–16, pp. 103–128.

[70] Le Clerc's French translation of the 'Epitome', 'Extrait d'un Livre Anglois qui n'est pas encore publié, intitulé Essai Philosophique', was first published as an article in the *Bibliotheque Universelle & Historique* (1688) 49–142 and later in the same year published separately in Amsterdam, *Abrégé d'un ouvrage intitulé Essai philosophique touchant l'entendement.* The dedication in the *Essay* to the Earl of Pembroke is still absent in both the 'Epitome' and the 'Extrait', but is included in the *Abrégé.*

> In the thoughts I have had concerning the understanding I have endeavourd to prove that the minde is at first rasa tabula. But that being only to remove the prejudice that lies in some mens mindes I thinke it best in this short view I designe here of my principles to passe by all that preliminary debate which makes the first book.[71]

The Oxford scholar John Wynne (*c.* 1665–1743), who in 1696 published an abridgement of the *Essay* that was approved by Locke, suppressed the first book on similar grounds.[72]

In book III, Locke's principal target is the logic of Aristotle rather than the philosophy of Descartes. Some of the topics that Locke discussed in book III had already been addressed in a disparate way in Drafts A and B. It was only later that he decided to devote a separate book to words. He concedes as much at the very end of book II. Having discussed separate ideas (the first stage of his logic of ideas), he admits that the most logical next step would be to proceed at once with knowledge (the second stage of his logic):

> This was that, which, in the first general view I had of this Subject, was all that I thought I should have to do: but upon a nearer approach, I find, that there is so close a connexion between *Ideas* and Words; and our abstract *Ideas*, and general Words, have so constant a relation one to another, that it is impossible to speak clearly and distinctly of our Knowledge, which all consists in Propositions, without considering, first, the Nature, Use, and Signification of Language; which therefore must be the business of the next Book.[73]

Words should be carefully scrutinized and upon this task Locke embarks in book III. His critical discussion of the instruments that Aristotelian logicians forged out of words, i.e. verbal propositions and syllogisms, is subsequently continued in book IV. Rather than detracting from the bipartite structure presented by books II and IV, books I and III are additions whose substantially polemical purport was meant to smooth the transition to Locke's logic of ideas. The *content* of book III has proved to be of eminent importance, especially for future developments in the philosophy of language. However, considered from the *structural* perspective of the shift from a tripartite Aristotelian logic towards a bipartite logic of ideas, this book is a side-show produced by an after-thought.

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[71] MS Locke c. 28, fol. 52r. I thank Prof. G.A.J. Rogers for permission to use his transcription. The 'Epitome' was published in King, *The Life of John Locke*, vol. I, pp. 231–293.

[72] Wynne, *An Abridgement of Mr Locke's Essay*, pp. iv–v.

[73] Locke, *Essay*, II. xxxiii. 19, p. 401.

3.4. *Conclusion*

When Gabriel Nuchelmans wrote about the transition from Aristotelian logic to novel systems of logic in the seventeenth century:

> Some of the philosophers who made substantial contributions to this change of outlook themselves wrote treatises of logic, for instance, Gassendi's *Institutio logica* of 1658 and Hobbes's *Computatio sive logica* (first part of De Corpore) of 1655. Others, like Descartes and Locke, left it to their followers to apply the new insights to the field of logic.[74]

he was quite right about Descartes, but curiously wrong about Locke, who further developed three major and interconnected elements in Descartes's philosophy (ideas, faculties, method) in his own way and brought them together in the *Essay*, which amongst other things is an alternative treatise of logic. Placing Locke alongside with Arnauld and Malebranche in a novel logical tradition that originated with Descartes, has provided us with a perspective that allows us not only to evaluate and compare the meaning and function of clear and distinct ideas, but also the subjects of method and epistemology in general, and rationalist and empiricist strands in particular. The debate and the interaction between Aristotelian logic and new logic, between content and structure and between rationalism and empiricism did not stop with Locke; we shall now address the reception of these themes in the decades that followed the publication of the *Essay*.

[74] Nuchelmans, 'Logic in the Seventeenth Century', p. 105.

CHAPTER FOUR

THE DUTCH CONTEXT

4.1. *Introduction*

Suppose one were to put the usefulness of the characterization of the logic of ideas in three elements and three dimensions to the test, by studying its reception during during the decades that followed the publication of Locke's *Essay*, what kind of text, i.e. what kind of medium, would be the most interesting? And suppose one would have to limit this history to one country, which country would hold most promise? Given the structural dimension of our analysis we would prefer logical textbooks. They are part of a long tradition and their simple structure can be compared with the structure of predecessors in the Aristotelian tradition. Next, we would preferably turn to a country where logical textbooks continued the discussion between Aristotelian logic and the new logic in both its rationalist and its empiricist forms. Since we are interested in the interplay between Cartesian and Lockean elements, we would prefer a country that was influenced by Descartes while at the same time having an early reception of Locke. No country meets our specifications better than the Dutch Republic between 1690 and 1750. Before embarking on an examination of separate Dutch logicians, however, it is useful to make a few short remarks about the intellectual infrastructure of the Republic, about Dutch Aristotelian logic and about the Dutch Cartesian and empiricist traditions in the seventeenth century.

4.2. *Books, Journals and Universities*

The traditional picture of the Dutch Republic in the period after its Golden Age is rather bleak. As late as 1972 we can still read in a monograph on the subject that in the eighteenth century the Dutch did not go beyond exporting the ideas developed by their foreign residents, without making substantial additions themsel-

ves.[1] Since then, revisionist tendencies have carried the day. For instance, Jonathan Israel contends that

> By the first decade of the eighteenth century, Dutch science, like art and philosophy, was still in full flood. There was no sign yet of any lessening of vitality or creativity. It was also still the leading science in Europe in many sectors, particularly microscopes, anatomy, botany, insects, optics, some areas of chemistry, and—the aspect most widely noticed—in clinical methods and application of science to medicine.[2]

In general, Israel states, 'For Europe, the Dutch Enlightenment may be said to have been fundamental in the first third of the eighteenth century, of some, but diminishing, importance to the second, and marginal by the third.'[3]

At the start of the eighteenth century the Dutch Republic was still a safe-haven for many European intellectuals and the undisputed production centre for their books and journals. While the Dutch international book trade during its first phase had been dominated by academic books written in Latin, the period 1680–1725 saw a massive rise in French publications, largely due to the influx of Huguenot refugee authors and journalists seeking a new home in the Dutch Republic. Book traders in the Netherlands were able to offer lower costs of printing than elsewhere and profited from the intellectual, academic and financial contacts between Huguenots in Holland and their brethren in other Protestant countries. Moreover, the trade profited from the accessibility of old overland trade routes and newer sea routes that had been opened up by extremely successful merchants. Finally, in addition to their geographic position, at the cross-roads of European trade, the Dutch book traders had the advantage of a relatively large vernacular home market.[4]

The role of the Dutch Republic as intellectual depot of Europe was further enhanced by its universities. Whereas in many European countries conservative universities had formed an impediment to philosophical and scientific development, Dutch universities were all relatively new. The universities of Leiden (1575), Franeker (1585), Groningen (1614) and Utrecht (1636) were platforms for the de-

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[1] Zwager, *Nederland en de Verlichting*, pp. 30–31; in line with this traditional picture is Schama, 'The Enlightenment in the Netherlands', *passim*.

[2] Israel, *The Dutch Republic*, p. 909.

[3] *Ibid.* p. 1038.

[4] Davies, 'The Geographic Extent of the Dutch Book Trade', pp. 10–21; Gibbs, 'The Role of the Dutch Republic', pp. 323–349; Bots, 'Les Provinces-Unies', pp. 297–306 and Chartier, 'Magasin de l'Univers', pp. 289–307.

velopment of novel ideas and attracted sizeable numbers of foreign students well into the eighteenth century. Between 1575 and 1750, the number of graduated foreign students ranged from 22% to 28%, and in the period 1700–1724 the number was even as high as 32.6%.[5] This phenomenon was matched by a steady stream of foreigners who received academic appointments at Dutch universities. The governing classes of the Dutch Republic held representatives of *academia* in high esteem and professorships were considered among the most prestigious of civil functions.[6]

Philosophy as an academic discipline was taught at the propaedeutic faculty of the arts. The courses in the arts faculties were strictly speaking instrumental to subsequent courses provided by the higher faculties of theology, medicine and law. The arts faculties were generally divided into a literary and philological section and a philosophical and mathematical section (including applied mathematics, i.e. astronomy, optics and mechanics). The arts faculties saw the number of students decline from the end of the seventeenth century onwards. However, this was not a sign of decline of their constituent disciplines. What happened, rather, was that these disciplines were annexed by the higher faculties for which they had provided propaedeutic functions; thus courses in the oriental languages moved from the arts faculties to the theological faculties. Professors in philosophy generally received a lower salary than their colleagues in the higher faculties. Yet philosophy in general, and natural philosophy at Leiden University in particular, had attracted eminently competent professors who were given a high degree of liberty to pursue their scientific interest and whose status by 1700 was as high as that of their colleagues in theology, medicine or law. Since Dutch universities initially managed to incorporate and teach up-to-date scientific developments, it is not surprising that scientific academies and learned societies, which had been forceful stimulators of novel ideas in other European countries, did not arise until 1750, when Dutch universities, along with cultural life in general, had definitely started their long and inexorable downward turn.[7]

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[5] Frijhoff, *La société néerlandaise*, 'Annexe 1', p. 379.

[6] Frijhoff, *La société néerlandaise*, pp. 279–280.

[7] *Ibid.* pp. 40–43; Van Berkel, 'Universiteit en natuurwetenschap', p. 110; Wiesenfeldt, *Leerer Raum in Minervas Haus*, pp. 31–35; and McClellan, *Science Reorganized*, p. 123.

4.3. *Aristotelianism*

Dutch universities in the first half of the seventeenth century generally subscribed to an Aristotelian curriculum. Franco Burgersdijck (1590–1635) played a major role in providing the various philosophical disciplines with adequate textbooks. He became professor in logic and ethics at the university of Leiden in 1620, and in 1628 he was charged with lectures in physics as well. His *Institutiones logicæ* (1626) was by no means the only Aristotelian textbook on logic produced in the Dutch Republic before 1690, but the book was by far the most influential, and it gained wide acceptance outside the Republic, notably in Oxford, Cambridge, Harvard and Yale. Burgersdijck was a pedagogue who preferred a clear presentation of existing information to a display of original insights.[8] His Aristotelianism was not a rigid doctrine but rather provided academics with a technical vocabulary that was not inimical to new ideas, although a line was generally drawn at such *novatores* as Descartes, let alone Spinoza. 'Aristotelianism' in this wide sense (including Aristotelian logic), continued to flourish at Dutch universities until well into the eighteenth century.[9] One of the last Dutch Aristotelians, the Utrecht professor Johannes Horthemels (1698–1776), managed to produce an oration as late as 1768, in which he attacked Spinozists and Hobbists with a militant Calvinism that recalls the harangues of Gisbertus Voetius (1589–1676).[10]

A good example of the tenacity of Aristotelian philosophy in the field of logic is provided by Johannes Regius (1656–1738). He studied philosophy and theology at Utrecht University and served as vicar at various parishes before he was appointed professor in philosophy at Franeker University in 1685. Although Regius can be considered an Aristotelian philosopher, he purported to be critical of medieval scholastics who had mutilated the philosophy of Aristotle. Occasionally he is not averse to criticizing the Philosopher himself.

In 1705 Regius published his *Institutionum logicarum epitome. In usum Scholarum Domesticarum vulgata.* This logical textbook contains little that is not conventionally Aristotelian. The ten Aristotelian categories are faithfully expounded and syllogisms still hold an unqualified place of pride. There is no trace of a new logic of ideas nor is there much that points, in a more general way, to an increased attention for the human faculties. Yet Regius was aware that his brand of

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[8] Van Reijen, 'Burgersdijk', pp. 9–28.

[9] Van Bunge, *From Stevin to Spinoza*, pp. 27–33.

[10] Horthemels, *Oratio de libertate philosophandi* (1768).

logic was in danger of becoming a threatened species. In the preface he seems to defend his book against critical remarks by representatives of the logic of ideas, when he states: 'it is most regrettable that this distinguished and very essential art is neglected by many and, what is worse, despised by some, and degraded and censured as a trifling and babbling art'.[11] As motto for his *Epitome* Regius chooses the following quotation from Clement of Alexandria: 'Dialectics [i.e. logic] serves as a rampart so that truth is not trampled upon by the sophists.'[12] In this way Regius tries to take his textbook out of the despised category to which it would undoubtedly have been relegated by adherents of the new logic.

One of the most salient features of Regius *Epitome* is the frequent use of the word *thema.* This word may seem original to the extent that we have not encountered the expression in our previous survey of logical works. This terminology, however, is anything but forward looking. A *thema* is 'whatever can be offered to the mind to be known, whether it be a true or a fictitious thing'.[13] A *thema* is *simplex* 'when it is separated from all other [*themata*] to such a degree that it implies nor supposes anything conjoint with or rather outside itself'.[14] A *thema* is *complexum* when it 'is presented in conjunction with something else; or, if separated from anything else, necessarily implies or supposes something else beside itself'.[15] This division between simple and complex *themates* should in no way be associated with a Lockean distinction between simple and complex ideas. Rather, Regius is here (and at other places in the *Epitome*) merely quoting the *Institutiones logicæ* of Burgersdijck, who had made a similar use of *thema simplex* and *thema complexum.* Burgersdijck in his turn had borrowed from a tradition that included Bartholomaeus Keckermann (1571/3–1608/9) and which went back ultimately to Philipp Melanchton (1497–1560).[16] Once it is understood that in Re-

[11] Regius *Epitome,* p. [x]: 'dolendum sane est, hanc egregiam & maxime necessariam artem a multis negligi, &, quod pejus, a quibusdam sperni, & tanquam artem nugatoriam (quod & olim Platonis temporibus a Sophististis factum) garrulamque, traduci atque vituperari'.

[12] *Ibid.* 'Est enim Dialectica veluti vallum, ne veritas conculcetur a Sophistis.'

[13] *Ibid.* ii, p. 2: 'quicquid intellectui cognoscendum proponi potest, sive res vera sit, sive ficta'.

[14] *Ibid.* ii, p. 2: 'ab omni alio ita est sejunctum ut secum, vel potius præter se, nihil infereat vel supponat'.

[15] *Ibid.* ii, pp. 2–3: 'proponitur cum alio conjunctum, vel ab eo disjuntum: vel etiam præter se necessario aliud infert, vel supponit'. See also Isendoorn, *Logica peripatica* (1652).

[16] Nuchelmans, *Late-Scholastic and Humanist Theories,* pp. 189–203.

gius' *Epitome* 'thema simplex' is comparable to 'term', while 'thema complexum' takes the place of 'proposition', it is not difficult to appreciate the conventional content and structure of Regius' logic.

It would hardly be fair to accuse Regius of a lack or originality in his logic, since he had no pretensions in this direction. In the preface he praises Burgersdijck's *Institutiones* and states his purpose of abridging and clarifying this work which according to him is still useful for young students. Regius does not forget to stress that he has left out Burgersdijck's scholastic metaphysical examples. Thus he must have hoped to present a scholastic textbook that would give as little occasion as possible for ridicule by his modern colleagues. The result is a booklet that is even shorter than Burgersdijck's own abridged version of the *Institutiones* (the *Institutionum logicarum synopsis, sive rudimenta logica*, 1632). Regius' *Epitome* in general and the archaic use in 1705 of the word 'thema' in particular (even although this term has been noted to be in decline from 1650 onwards),[17] are exemplary for the long period that Aristotelian logic managed to cling tenaciously to existence whilst being an object of ever increasing ridicule.

4.4. *Cartesianism*

The most formidable contender of Aristotelianism was no doubt Descartes, who spent most of his productive life in the Dutch Republic. The story of the tumultuous progress of his philosophy in the Netherlands has been told in numerous studies and need not detain us here.[18] Nevertheless it may be useful to notice some trends. Cartesianism, although never completely superseding Aristotelian philosophy, became the dominant philosophy at most Dutch universities in the second half of the seventeenth century. This supremacy proved to be of relatively short duration. Already at the end of the seventeenth century distinct signs of decline could be detected that became ever more acute in the first half of the eighteenth century. However, this is only a very general trend. Although Descartes had always stressed the unity of his entire philosophical system, the fate of its various subdisciplines was by no means the same. The breakdown of Cartesianism pertained especially to physics, not only in the Dutch Republic but even in France. In 1738 Madame Du Châtelet wrote

[17] *Ibid.* p. 201.

[18] For the most recent comprehensive discussion of Dutch Cartesianism, see Van Bunge, *From Stevin to Spinoza*, pp. 34–93.

about Descartes's system of *tourbillons*: 'It is a house collapsing into ruins, propped up on every side. I think that it would be prudent to leave.'[19]

Compared to Descartes's physics, his metaphysics fared rather better. Initially, at around 1650, it had been the special object of scorn by Aristotelian professors at Leiden and elsewhere. Aristotelians had reacted vehemently against Descartes's anti-empirical epistemology, against the supposedly atheistic implications of his method of radical doubt, and against his onslaught on such time-honoured academic media as the commentary and the disputation. This had caused early Cartesians such as Johannes de Raey (1621–1702) to look for ways of defending Descartes's physics whilst at the same time circumventing his metaphysics.[20] By 1725 however, the picture had been completely reversed.[21] Descartes's physics had been largely supplanted by Newton's physics, while the Frenchman's metaphysics had turned out to be rather more viable. Thus, at Utrecht University, we see the Newtonian Jacobus Odé (1698–1751) rejecting Cartesian physics while at the same time expressing continued adherence to Descartes's *cogito* and his method of doubt.[22] Similar views were propounded by Campegius Vitringa (1659–1722) in Franeker and by Johannes Lulofs (1711–1768) in Leiden.[23]

The Cartesian logic of ideas was largely exempt from similar dramatic shifts of fortune. The enduring influence of Descartes on the French *Port-Royal Logic* and on later logicians is matched by his continued presence in Dutch treatises, although none of these followed Descartes as closely and exclusively in his epistemology and methodology as had been the case with Arnauld. Descartes's influence is notable in various ways and degrees in works of Clauberg, Geulincx and Spinoza.

Although the German Johannes Clauberg (1622–1665) worked at the *gymnasium* (later university) of Duisburg when he published his *Logica vetus et nova* (1654), he was a pupil of Johannes de Raey and

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[19] Châtelet to Charles François de Cisternay Du Fay, September 1738, *Lettres de la Marquise du Châtelet*, I, p. 261: 'C'est une maison qui tombe en ruine et que l'on étaie de tous côtés. Je crois qu'il serait plus prudent d'en sortir.' Transl. in Guerlac, *Newton on the Continent*, p. 73.

[20] See Schuurman, '*Ex naturæ lumine & Aristotele*', *passim*.

[21] Compare this outline of the Dutch situation with the fortunes of Cartesian metaphysics in the wider European context, in Watson, *The Breakdown of Cartesian Metaphysics*, pp. 149–152.

[22] Odé, *Oratio de laudabili priscorum hominum philosophandi methodo*, *passim* (1723).

[23] Sassen, *Johan Lulofs*, p. 11.

published his work in Amsterdam. Clauberg was an exponent of a 'Cartesian scholasticism' that had its most prominent representatives in the Dutch Republic and that saw an assimilation to Aristotelian academic views and forms as the most efficient way of promoting the new philosophy.[24] He defines logic as an art that should not concern itself with arid sophistry but that should rather help us direct our mind in the acquisition of new knowledge. Clauberg stresses the importance of a first stage in which we try to obtain clear and distinct ideas and a second stage in which propositions are formed that are based on these ideas. These stages are explicitly linked to the mental activities of perceiving and judging respectively.[25] In addition, he seems to defend Descartes's method of doubt. However, he moderates the Cartesian experiment of radical doubt into a more palatable step-by-step method. Cartesian doubt is not supposed to result in an Archimedean point of departure for all subsequent knowledge, but is considered rather as a device to eliminate individual errors.[26] Moreover, Clauberg takes care to stress that Descartes did not dismiss the use of Aristotelian syllogisms out of hand, but rather inveighed against a dialectic that limited itself to disputations and sterile *loci topici*.[27]

Arnold Geulincx (1624–1669), born in Antwerp, was another foreigner who contributed to Dutch philosophy. In 1662 he obtained a lectureship in logic at the university of Leiden, where in 1665 he became professor extraordinary of philosophy and ethics. Although Geulincx has generally been given the epithet 'Cartesian', his *Logica fundamentis suis restituta* (1662) contains little to commend it as a specimen of the logic of ideas. The basic elements of Geulincx's logic are not clear and distinct ideas or perceptions but affirmations (and negations).[28] Moreover, method, understood as a 'science of

[24] Bohatec, *Die cartesianische Scholastik*, pp. 87–102.

[25] Clauberg, *Logica vetus & nova*, in: id. *Opera Omnia philosophica*, p. 786: 'nam primo discendum est, quomodo quid clare ac distincte *percipere*; deinde quomodo de iis, quæ percepimus, recte *judicare*'.

[26] See Schneiders, 'Vernünftiger Zweifel', p. 147: 'Der allgemeine und abstrakte Zweifel wird zur speziellen und konkreten Vorurteilskritik, die nicht ein für allemal mit aller Unwahrheit aufräumt, sondern diese punktuell und sukzessive immer wieder bekämpft. Die einmalige dubitatio wird zu einer ars dubitandi, der methodische Zweifel zur systematischen Vorurteilskritik.'

[27] See Bohatec, *Die cartesianische Scholastik*, p. 89.

[28] Geulincx, *Logica restituta*, in: id. *Opera Omnia philosophica*, p. 175: 'Radix Logices est Affirmatio.'

sciences', is regarded as a separate discipline, distinct from logic;[29] consequently, a separate *Methodus inveniendi argumenta* appeared in 1663.[30]

Finally, although he was not a straight-forward Cartesian, some space should be devoted here to Benedictus de Spinoza. He mentions the word 'logic' only once in the entire *Ethica*, at the beginning of part V, saying that in this part he does not want to point out the method and means whereby the understanding can be perfected, which is the task of logic, but rather treat the dominion of the mind over the emotions.[31] This passage shows that, at least in the *Ethica*, he is not interested in a concept of method that lies at the very heart of the logic of ideas. However, in the *Tractatus de intellectus emendatione, et de viâ, quâ optimè in veram rerum cognitionem dirigitur*, which comes closer to being a logical treatise than the *Ethica*, he follows up his defence of true knowledge as knowledge of essences with methodical precepts on 'the Way and Method by which we may achieve this kind of knowledge of the things that are to be known'.[32] In the same treatise, Spinoza stresses the connection between method and faculties: 'The better the mind understands its own powers, the more easily it can direct itself and propose rules to itself.'[33] He is interested especially in the distinction between imagination and intellect. The imagination is a source of fictitious and false ideas, because these ideas 'do not arise from the very power of the mind, but from external causes, as the body (whether waking or dreaming) receives various motions'.[34] Clear and distinct ideas can only be obtained by the intellect, and method gives an answer to the question of how these

[29] *Ibid.* p. 454: 'Methodum tractare non concernit Logicum, sed aliam aliquam Scientiam, secundam a Logicâ, anonymam hactenus, quam circumloquendo vocare possemus *Scientiam de Scientiis.*'

[30] See also Nuchelmans, *Geulincx' Containment Theory of Logic, passim.*

[31] Spinoza, *Ethica*, V, 'Præfatio', p. 277: 'Quomodo autem, & quâ viâ debeat intellectus perfici, & quâ deinde arte Corpus sit curandum, ut possit suo officio rectè fungi, huc non pertinet; hoc enim ad Medicinam, illud autem ad Logicam spectat. Hîc igitur, ut dixi, de sola Mentis, seu rationis potentiâ agam, & ante omnia, quantum, & quale imperium in affectûs habeat, ad eosdem coërcendum, & moderandum, ostendam.'

[32] Spinoza, *De intelllectus emendatione*, p. 13: 'tradenda est Via & Methodus, quâ res, quæ sunt cognoscendæ, tali cognitione cognoscamus'. Transl. Curley, p. 16; see also De Dijn, 'Spinoza's Logic', pp. 15–25 and Amann, *Ganzes und Teil*, pp. 137–180.

[33] Spinoza, *De intellectus emendatione*, p. 16: 'quò autem meliùs suas vires intelligit, eò faciliùs potest seipsam dirigere, & regulas sibi proponere'. Transl. Curley, p. 19.

[34] Spinoza, *De intellectus emendatione*, p. 32: 'quæ non oriuntur ab ipsâ mentis potentiâ, sed à causis externis, prout corpus, sive somniando, sive vigilando varios accipit motûs'. Transl. Curley, pp. 36–37.

ideas can be obtained. All this is in accordance with the logic of ideas. Neither the *Ethica* nor the *Tractatus de intellectus emendatione*, however, devote much attention to the two stages of the logic of ideas. Spinoza is interested primarily in establishing how we can obtain the clear and distinct ideas by which we can overcome our passions, and he is less interested in clarity and distinctness as a basis for subsequent reasoning which is typical for the logic of ideas. Although the verdict must be that Spinoza was an unqualified logician of ideas as little as he was an unqualified Cartesian, the fact remains that the Dutchman Petrus van Balen (1643–1690) chose the format of a logical textbook for an exposition of the main themes of Spinoza's philosophy. *De Verbetering der Gedagten Omtrent waarheit en valsheit: Of Waare Logica* was published in 1684 and its Dutch title echoes Spinoza's *Tractatus de intellectus emendatione*. Van Balen's textbook is an example of an explicitly 'facultative' logic and is structured around five mental operations: perception, judgement, reasoning, ordering and remembering.[35]

4.5. *Empiricism*

Although it is probably true that philosophy in the Dutch republic was taking an 'empirical turn'[36] in the early eighteenth century, this phenomenon was prepared by circumstances and developments in the previous century that still await further study and that can only summarily be touched on in the present context. Philosophers and scientists in the Dutch Republic played a vital role in the development of mechanical science. Perhaps their greatest contribution to the Scientific Revolution consisted in a detailed exploration of the natural world, and in a preoccupation with getting the details right, rather than in the development of a complete alternative world view. At Leiden University the epitomes of scientific development consisted of a first-rate botanical garden and an anatomical theatre. François de le Boë Sylvius (1614–1672) fruitfully combined anatom-

[35] See also Van den Hoven, 'Petrus van Balens spinozistische logica', *passim* and Israel, *Radical Enlightenment*, p. 314: 'Unlike most writers on the subject, Van Balen provides no technical analysis of thinking and rarely any special terminology. His unwavering purpose is, withouth saying so, to highlight, paraphrase in easier terms, and thereby elucidate key steps in Spinoza's system'. For another Dutch specimen of what could be called a 'Spinozist logic' see Cuffeler, *Specimen artis ratiocinandi naturalis & artificialis* (1684).

[36] See Van Bunge, 'A New Research Project', p. 102.

ical, clinical and chemical knowledge and was followed by a generation of experimental scientists such as Niels Stensen (1636–1686), Jan Swammerdam (1637–1687) and Reinier de Graaf (1641–1673). The hunger for new facts was satisfied by rare specimens, dead or alive, that reached the Dutch from the outposts of their colonial empire in Asia, Africa and the Americas, while spectacular impressions of the hidden micro-structure of nature were provided by the microscopic observations of Antonie van Leeuwenhoek (1632–1723).[37]

Nevertheless, although experiments were held in high esteem in Dutch society at large, the ideal of mathematical certainty continued to hold sway in the academic discipline of physics. Even the eminent non-academic Christiaan Huygens (1629–1695), for all his use of experiments, favourably compared the demonstrative certainty that is based on axiomatic truths with the merely probable results produced by experiments.[38] Initially, neither peripatetic tradition nor Cartesian novelty acted as much of a stimulus to the inclusion of experimental physics in the academic curriculum. This situation changed in the second half of the seventeenth century. In 1674 Burcher de Volder (1643–1709), professor in philosophy and mathematics at Leiden University, asked permission from the curators of the university to start a course in experimental physics. His request was granted. Funds were provided, instruments were acquired, a house was purchased, and as early as in 1675 Leiden University could open a *Theatrum physicum* that was used by De Volder himself and also by his colleague Wolfert Senguerd (1646–1724). In addition, the chemist Carolus Dematius (1640?–1690) received permission to supplement the chemical experiments in his *laboratorium chemicum* with physical experiments. Leiden University was among the first universities in Europe to provide facilities for scientific experiments. Although experiments had been part of the *curriculum* at Italian universities, it was not until 1690 that a special laboratory was opened in Bologna. Although Newton himself had lectured at Cambridge University between 1669 and 1701, experimental physics was not taught there until 1707. The university of Paris did not have a special chair for experimental physics before 1751. The introduction of instruments at Dutch universities was not confined to Leiden University. Johannes Bernouilli (1667–1748), who worked at Groningen University between 1694 and 1705, not only taught mathematics but experimental philosophy as well, and for his les-

[37] Cook, 'The New Philosophy', passim, and Ruestow, *The Microscope*, pp. 146–200.
[38] Cook, 'The New Philosophy', p. 136.

sons in the latter discipline he made use of scientific instruments. Short-lived attempts in the same direction were undertaken in 1700 by Adrianus Reeland (1676–1718) in Harderwijk and in 1701 by Ruardus Andala (1665–1727) in Franeker, while experimental physics at Utrecht University had to wait until the appointment of Petrus van Musschenbroek in 1723.[39]

De Volder's request for a *Theatrum physicum* in 1674 was largely prompted by a recent visit to England, where he had been impressed by the experimental natural philosophy of Robert Boyle and other members of the Royal Society.[40] The consequences of this trip abroad formed part of a wider trend of British influence on Dutch science. Although the sway of British empirical philosophers before the end of the seventeenth century never threatened the ascendancy of Descartes, and although the precise form and extent of the British influence still awaits detailed scrutiny, a good case can be made for at least a continuous presence of Francis Bacon in seventeenth-century Dutch science and philosophy. Most of the Chancellor's English books were published in Latin versions in the Netherlands, and in 1646 Peter Boener, a pharmaceutical chemist from Nijmegen, undertook the translation of the *Essays*, the *Meditationes sacræ* and *De sapientia veterum* in a single Dutch volume,[41] while ten years later a mysterious 'J. Williaemson' produced a Dutch translation of the *New Atlantis*.[42] Already in 1621 Constantijn Huygens (1596–1687), who had met Bacon on a diplomatic mission in England, had recommended the recently published *Instauratio magna* to the Leiden professor Daniel Heinsius (1580–1655). The physicist and mathematician Isaac Beeckman (1588–1637) read this work and subsequent works with interest, and in 1629 the botanist Jan Brosterhuysen (1596–1650) repeated some of the experiments described in the *Sylva sylvarum*. Almost a century later, the formative influence of Bacon on the great professor of medicine and chenistry Herman Boerhaave (1668–1738) was still clearly detectable.[43]

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[39] Ruestow, *Physics at 17th and 18th-Century Leiden*, pp. 96–98; Hackmann, 'The Growth of Science', *passim*; and De Pater, *Petrus van Musschenbroek*, pp. 4–23.

[40] Wiesenfeldt, *Leerer Raum in Minervas Haus*, pp. 103–107 and p. 138 and Hackmann, 'The Growth of Science', p. 97.

[41] Bacon, *De Proef-Stucken, midtgaders, sijn heylige meditatien, en de wijsheyt der ouden* (1646), quoted in: Elena, 'Baconianism', p. 42.

[42] Bacon, *Nieuwen Atlas, ofte beschrijvinge van het noyt meer gevonden Eylandt van Bensalem* (1656), quoted in: Elena, 'Baconianism', p. 43.

[43] Dibon, 'L'Œuvre de F. Bacon', pp. 191–220 and Elena, 'Baconianism', *passim*.

Finally, it is remarkable that in so far as Bacon influenced not only scientific practice but also philosophical reflection in the Dutch Republic, this was not primarily on account of his empiricism, but rather because he was considered (together with, for instance, Descartes) a major exponent of a new philosophy in general. Thus, when the Leiden professor Adriaan Heereboord (1614–1661) pronounced in *De Libertate philosophandi* (1647) on the necessity of disposing ourselves of false idols and prejudgements, he could mention Bacon in one breath with Descartes.[44] In a similar way the Cartesian De Raey had no qualms in using Bacon, to the extent that his works formed an effective instrument against an antiquated Aristotelianism.[45] In our previous discussion of French and British logicians of ideas we have already seen rationalism and empiricism on the same front in a battle against Aristotelianism. We shall encounter examples of a similar alliance in our discussion of Dutch logicians.

4.6. *Conclusion*

The Dutch Republic at around 1690 gives the picture of a still vigorous Cartesianism; of a persistent Aristotelianism; of logical textbooks that are deeply influenced by elements of both philosophies, sometimes intertwined in the guise of a 'Cartesian scholasticism'; and of a robust presence of experience and experiment in the practice of scientific research that had found its way to the academic curriculum. Most strikingly, however, in spite of the reception of Bacon, Dutch experimental *practice*, whether academic or non-academic, was not

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[44] Heereboord, *De libertate philosophandi* (quoted in Dibon, 'L'Œuvre de F. Bacon', pp. 205–206): 'renunciandum esse omnibus mentium nostrarum idolis, eradicandas esse opiniones præconceptas, tollenda omnia præjudicia, et animum ad Philosophiam esse adferendum, qualis est infantis, in quo nihil pictum est aut fictum aut scriptum actu, sed quidvis fingi, pingi, scribi in eo potest. Hanc fuisse viam tritam ac calcatam Aristoteli et præclaris semper omnium secularum ubivis gentium ingeniis, ac nostro ævo Illustri D. VERULAMIO in aureo opere *Instaurationis magnæ* et *de Augmentis scientiarum*, atque etiamnum teri et calceri ingenio incomparabili veritatis ex caligne et servitute emergentis promotori unico, D. RENATO DESCARTES'.

[45] See De Raey, 'Epistola dedicatoria' to the *Clavis philosophiæ naturalis*, [p. iv]: 'Hos inquam scopulos & hæc præcipitia, ut sine offensionis vel lapsus periculo declinarem, in mentem primum venit civilis prudentiæ canon, à Verulamio libro ii de Aug. scientiarum Jacobo Magnæ Britanniæ, &c. Regi adscriptus. *In omni*, inquit, *vel consuetudine vel exemplo tempora spectanda sunt, quando primum res cœpta; in quibus si vel confusio regnaverit, vel inscitia, derogat illud imprimis authoritati rerum, atque omnia suspecta reddit.*'

supported by any modern *philosophy* that provided an empiricist epistemology and methodology and that formed a third way, in addition to Aristotelianism and Cartesianism.[46] This situation was to change soon after 1690 and the first medium to embody this change would be a logical textbook. The rest of the present study will be devoted to five logical textbooks that were published between 1690 and 1750 by five Dutch logicians, i.e. academics who worked in the Netherlands and who published their logical textbooks for the first time in the Netherlands.[47] We shall see that each of these textbooks is unmistakenly coloured, and coloured differently, by its reception of the logic of ideas.[48]

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[46] See also Vermij, *Secularisering en natuurwetenschap*, p. 132. An interesting and early exception to the dominant position of rationalism may have been the views of the Utrecht professor Henricus Reneri (1593–1639), see Dibon, 'L'Œuvre de F. Bacon', pp. 206–220. Reneri's admiration for both Bacon and Descartes was expressed in unmistakenly empiricist terms. Reneri, however, never produced a complete empericist epistemology or methodology. Also noteworthy is the attack against Cartesian innate ideas in the early 1680s by Gerard de Vries (1648–1705), also from Utrecht University, mentioned by Israel in *Radical Enlightenment*, p. 479; however, according to Israel De Vries was not the representative of a modern empiricism that was distinct from both Aristotelianism and Cartesianism: 'While discarding the old Aristotelian terminology and most of its apparatus, he retained the idea of the mind being a *tabula rasa* and sense perception the origin of all human ideas, combining empiricism with residual strands of Aristotelianism.'

[47] Poortman, *Repertorium*, p. 84.

[48] The five textbooks by Le Clerc, De Crousaz, Engelhard, 's Gravesande and Van Musschenbroek were not the only works on logic produced in the Dutch Republic between 1690 and 1750. I have already discussed Regius' *Institutionum* (see above, §4.3). In addition, there is the *Bespiegeling der reden-leer* (1696) by J. Aalstius and the *Nederduytse redekonst* (1710–1714) by J. Huwé, but these Dutch works do not add much to the content of their Latin counterparts.

CHAPTER FIVE

JEAN LE CLERC: LOCKEAN EMPIRICISM IN TEXTBOOK FORMAT (1692)

5.1. *Introduction*

Jean le Clerc (Latinized 'Johannes Clericus') was a versatile Remonstrant theologian, encyclopaedist and philosopher. He was born in Geneva in 1657, and after peregrinations in France and England he settled down in Amsterdam in 1683, where in the following year he was given the chair of philosophy at the Remonstrant seminary. Until his death in 1736, Amsterdam remained the place where he would lead a scholarly but not very peaceful existence. His life was marred by accusations of Socinianism and his frequent complaints about his low salary were as bitter as they were futile. Le Clerc was a very prolific and versatile writer. Voltaire put him in the same league as Locke and Newton, who, according to him, belonged all to 'the greatest philosophers and the best writers of their time'.[1] Yet Edmund de Beer is probably right when he writes about Le Clerc: 'He did not appreciate his limitations of ability or opportunity. He did too much too quickly, applying the facility that was requisite for some parts of his work to other parts where it was out of place.'[2] In 1692 Le Clerc published his *Logica, sive ars ratiocinandi.* This textbook was published together with an *Ontologia* and a *Pneumatologia* by Johannes Wolters in Amsterdam. The *Ontologia* and the *Pneumatologia* were dedicated to John Locke. The *Logica* was dedicated to Robert Boyle, who died on 31 December 1691, before receiving the work.[3] In 1698 the three works appeared together in the *Opera philosophica.*

In the epistle to the reader of the *Logica* Le Clerc pays tribute to the 'Epitome' of Locke's *Essay*, to Arnauld's *Port-Royal Logic*, and to the *Recherche de la Vérité* by Malebranche. Here we see, one year before

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[1] Voltaire, *Lettres philosophiques*, 'Septième lettre', p. 64: 'les plus grands philosophes et les meilleurs plumes de leur temps'.

[2] Locke, *Corr.* III, p. 37.

[3] See letter by Jean le Clerc to Locke, 26 August 1692, Locke, *Corr.* 1525, IV, p. 501. See also Locke, *Corr.* 2300, VI, p. 178.

the similar observation by Molyneux (see above, ch. 1), the empiricist Locke mentioned in one breath with the rationalists Arnauld and Malebranche as representatives of an alternative logic. Already when Le Clerc's *Logica* was still under the press, he acknowledged his indebtedness to the *Essay* 'as one of the [works] that I found most useful' to Locke himself, in a letter dated 20 January 1692.[4] From a letter dated 11 April of the same year, we can gather that he had sent a copy of his logic to Locke.[5] Le Clerc's *Logica* deserves full scrutiny, since it is the first logical textbook in which we can detect a sizeable presence of Locke; it would take another 33 years before the content of the *Essay* would be accommodated to a British logical textbook.[6] It is difficult to assess the precise influence of the *Logica*,[7] but the work was reprinted many times, also in Britain, and the *Opera philosophica* were reprinted in 1700, 1704, 1710, 1722 and 1726. The *Logica* was among the texts used by the German philosopher Jacob Brucker (1696–1770) at his own university in Jena (1714–1720).[8] Before embarking on a detailed discussion of the *Logica*, I shall first pay attention to Locke and his relation with the Dutch Republic in general and Le Clerc in particular.

5.2. *Le Clerc and Locke*

In 1683 Locke took the same course as his patron Anthony Ashley Cooper, first Earl of Shaftesbury, who had run into political trouble with King Charles II and fled to the Netherlands in November 1682, where he had died in January of the next year. Although Locke lived the life of a political refugee who at one moment thought it prudent to take the pseudonym of 'Dr van der Linden', his life was never in serious danger, and he profited from his stay in the Netherlands to pursue his various scientific and scholarly interests. In the course of his stay he learned to read Dutch and even acquired the ability of writ-

[4] Locke, *Corr.* 1446, IV, p. 354: 'comme l'un de ceux qui m'ont le plus servi'.

[5] Locke, *Corr.* 1486, IV, p. 433: 'Il y a, Monsieur, dix ou douze jours, que j'envoiai à Mr. Furly deux exemplaires de mes petits Ouvrages de Philosophie, dont l'un relié en deux Tomes, et en marroquin rouge est pour vous, et l'autre en basane et en un volume pour M. L'Evêque de Salisbury'.

[6] Watts, *Logick* (1725). See Yolton, *Perceptual Acquaintance*, p. 112; Schuurman, 'General Introduction' to Locke, 'Conduct', pp. 92–95; and see below, §5.7, n. 84.

[7] I use the first edition of 1692.

[8] Blackwell, 'Epicurus and Boyle', p. 84.

ing a simple letter in this language.[9] Locke had always been the kind of thinker to need a sounding-board and in Amsterdam he developed close ties with the physicians Egbert Veen (1630-*c.* 1709) and Pierre Guennellon (1650–1722), the theologian Philippus van Limborch (1633–1712) and Jean le Clerc.[10] Locke learnt a great deal from these members of the informal *Collegium privatum medicum*, especially on the subject of midwifery and woman's diseases, a branch of medicine in which his Dutch colleagues were pre-eminent then.[11] Locke's final two years in the Republic were spent in Rotterdam, in the house of the rich Quaker merchant Benjamin Furly. Contacts with his Amsterdam friends continued and in addition Locke set up a new club, called 'The Lantern'. Locke's discussions were not limited to medicine. Louisa Simonutti rightly uses the term 'medical-religious circles' when describing Locke's Dutch contacts.[12] During his years of exile he read the religious and political works of Vossius, Coornhert, Uitenbogaert, Van der Waeyen, Van Dale, Spinoza, Velthuysen and Grotius. He was interested especially in the works of Dutch Remonstrant theologians, whose rational, anti-fanatical and anti-tyrannical opinions contributed towards his own views.

The Glorious Revolution of 1688 overturned James II and enabled Locke to return from exile. He left for England in February 1689, in the party that accompanied Mary Stuart, Princess of Orange. The extent of his direct involvement in political activities in favour of her husband William of Orange is unclear, but some of his aristocratic British friends in Holland played an active part in the various rebellious schemes and he shared their hostility to the Stuart kings.[13]

Locke had started work on the *Essay* already in 1671, well before he left Britain for the Netherlands, so that this work does not abound with traces of Dutch influence. However, a convincing case has been made at the very least for the influence of the correspondence with Van Limborch (continued after Locke's departure to Britain) on the changes that appeared in the fifth edition of the *Essay*, II. xxi, on the liberty of willing.[14] Although most of Locke's philosophical thought was already in place by the time he set foot on Dutch soil,

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[9] Colie, 'John Locke in the Republic of Letters', pp. 111–129; and Thijssen-Schoute, 'De Nederlandse vriendenkring van John Locke', pp. 90–103.

[10] Cranston, *John Locke*, pp. 231–311.

[11] Dewhurst, 'John Locke's Medical Notes', pp. 176–192.

[12] Simonutti, 'Religion, Philosophy, and Science', pp. 127–146.

[13] De Beer, 'Locke: from Utrecht to Rotterdam 1686–7', pp. 32–40; and Goldie, 'John Locke's Circle', pp. 557–586.

[14] See De Schepper, 'Liberty in Willing', *passim*.

his period of exile may have exerted a more general and altogether more decisive influence. In her letter of 12 January 1705 to Le Clerc, Lady Masham wrote that in Holland, at last 'he had full leisure to prosecute his Thoughts on the Subject of *Humane Understanding*: a work which in probalitie he never would have finish'd had he continued here.'[15] Simon Schaffer remarks that the nature of Dutch society and the content of Locke's reading in the Netherlands, by 'the ingenuous profession of nescience as cure for dispute and a resource against both enthusiast and tyrants',[16] acted as a generous confirmation of views he had developed earlier. In the Dutch Republic many of Locke's intellectual, political, social and medical goals seemed realized.[17]

When Locke crossed the Channel in 1683 he was an unknown gentleman of 51 with hardly anything in print. It was Jean le Clerc who, to his great merit, stimulated the philosopher to publish his works.[18] Locke started his post mid-life outburst of publications with a tiny 'Methode nouvelle de dresser des recueils' in Le Clerc's *Bibliothèque universelle & historique* in 1686. He also contributed various reviews to this journal. Le Clerc's French translation of the English summary of the *Essay*, the 'Extrait'/*Abrégé*, appeared in 1688, more than one year before the *Essay* was published.[19] While Le Clerc stimulated Locke to publish, the latter introduced the former to the future third Earl of Shaftesbury and also kept him abreast of new developments in British science and scholarship after he had returned to England in 1689. Although the relationship between Le Clerc and Locke was thus symbiotic in certain respects, it was not necessarily enjoyable to both in an equal way.[20] Edmund de Beer notes that 'Le Clerc's letters to Locke are full of complaints. They leave an unpleasant impression of his [Le Clerc's] character. It is probably fairest to regard them as the outpourings of a man in difficult circumstances to a sympathetic recipient.'[21]

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[15] Quoted in: Simonutti, 'Religion, Philosophy, and Science', p. 296.

[16] Schaffer, 'The Glorious Revolution and Medicine', p. 172.

[17] See also Rogers, 'Introduction' to *Locke's Philosophy*, p. 19.

[18] See Colie, 'John Locke in the Republic of Letters', p. 129: 'He might, of course, have come to publish at any point, but the fact is that in the vigorous and capable hands of Le Clerc and Limborch, in the city of Amsterdam where writing and printing were so natural to all good minds, Locke began to become Locke, and the obscure political exile turned into the philosopher *par excellence* of a new régime in thought.'

[19] See above, §3.3, note 70.

[20] See especially Bots, *De Bibliothèque Universelle et Historique, passim.*

[21] Locke, *Corr.* III, p. 38. On Locke and Le Clerc see also Savonius, 'John Locke and the Civil Philosophy of the *Bibliothécaires*'.

Le Clerc's *Bibliothèque universelle et historique* (1686–1693) was followed by the *Bibliothèque choisie* (1703–1713) and the *Bibliothèque ancienne et moderne* (1714–1730). The three *Bibliothèques* all gave due attention to Locke's works,[22] but Le Clerc was not the only Huguenot journal publisher in the Netherlands to be interested in English authors. Pierre Bayle in his *Nouvelle de la République des Lettres* and Henri Basnage de Beauval (1653–1723) in his *Histoire des ouvrages des savans* also paid attention to British ideas. These journals quickly managed to achieve an international reputation and Locke continued to subscribe to these periodicals after he had left Holland for England.[23] The importance of these journals went beyond the boundaries of the Dutch Republic (see also above, §4.2). Gabriel Bonno notes that in the decade following the publication of the *Essay* 'continental readers unfamiliar with English received their information about the *Essay* from the French periodicals published in Holland, which were widely read in France'.[24] Given the unfamiliarity with the English language on the Continent it does not come as a surprise that four out the five reviews of works by Locke in the *Histoire des ouvrage des savans* pertained to French translations instead of their English originals. Locke's presence in these journals was substantial, and the reception of his works took place from early on. Hendrika Reesink, in her book on the British presence in these journals, mentions 22 reviews of works by Locke or by authors writing against him.[25] These reviews were all published before 1709, and 15 were even published before 1700. Moreover, the French journals in the Republic had their Dutch imitators. One of the earliest to appear was the *Boekzaal van Europe* (1692–1702), which published reviews of the French translations of Locke's *Education*, his *Essay* and *The Reasonableness of Christianity*.[26]

The influence of Locke on the Dutch not only becomes apparent from the many reviews of his works, but also from the translations

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[22] Bots, 'Jean Leclerc as journalist of the *Bibliothèques*', pp. 63–64.

[23] Harrison, *The Library of John Locke*, p. 29.

[24] Bonno, 'The Diffusion and Influence of Locke's *Essay*', p. 76.

[25] Reesink, *L'Angleterre et la littérature anglaise*; the numbers of the 22 works are: 389, 390, 391, 408, 432, 683, 684, 685, 771, 919, 978, 979, 980, 981, 1043, 1061, 1066, 1377, 14491, 1449b, 1470a and 1470b.

[26] Janssen, 'John Locke and John Toland', pp. 295–308; and De Vet, *Pieter Rabus (1660–1702)*. Further research of later journals, with titles such as *De Guardian of de Britsche Zedenmeester, De Nieuwe Engelse Spectator* or *De Snapper of de Britsche Tuchtmeester*, will probably reveal more instances of Locke's influence. See Buijnsters, 'Bibliografie van 18e-eeuwse spectatoriale geschriften in Nederland', pp. 16–25.

of his works into Dutch.[27] A Dutch translation of *Education* appeared as early as 1698, followed in 1753 by an edition in which his educational ideas were adapted to the Dutch national character. The *Epistola de Tolerantia* was translated into Dutch in 1689, the same year that saw the appearance of the Latin original. Other translations followed in 1734 and 1774. A Dutch translation of the *Two Treatises* appeared in 1728 and of *The Reasonableness of Christianity* in 1729. Dutch translations of the *Essay for the Understanding of St. Paul's Epistles* and of the *Paraphrase and Notes on the Epistle of St. Paul to the Romans* were advertised in 1739. Locke's *Essay* has never been translated into Dutch, in spite of no less than three abortive attempts in the eighteenth century.[28] Yet the French translation by Pierre Coste (1700) first appeared in Amsterdam, fragments of the *Essay* were published in various Dutch journals throughout the eighteenth century, and in 1766 a Dutch translation was published of the 'Extrait'/*Abrégé* of the *Essay*.[29]

5.3. *Structure*

Le Clerc can be considered an adherent of the new logic of ideas in various regards. He maintains that logic is nothing but the art of reasoning well, and this definition should be understood within a clearly anti-Aristotelian context. According to Le Clerc, logic from the times of Zeno of Elea onwards had not served as an instrument for

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[27] Schoneveld, 'The Eighteenth-Century Afterlife of John Locke's Writings', pp. 3–22.

[28] Schoneveld, 'The Eighteenth-Century Afterlife of John Locke's Writings', pp. 13–15.

[29] The *Korte inhoud Van een Werk genaamt Wysgeerige Proeven, Aangaande het Menschelyk Verstand, Door den Heer Locke* (Antwerpen: W. Jugla, 1766) was a Dutch translation of the French translation of the 'Epitome' of the *Essay*. Cf. Yolton, *John Locke. A Descriptive Bibliography*, nr 308, who mistakenly holds the *Korte inhoud* for a translation of Locke's 'Conduct'. When taken together, the facts mentioned in the present and in the previous paragraph cast doubt on Jonathan Israel's apodictic contention concerning the limited influence of Locke on the Continent before the 1730s. See Israel, *Radical Enlightenment*, p. 523: 'All the evidence suggests it was the third French edition of 1729 [of the *Essay*] which gave Locke his continental stature.' (Israel's dating of the third French edition, by the way, is incorrect. He is probably referring to the *second* edition, which indeed appeared in 1729, see Yolton, *John Locke. A Descriptive Bibliography*, nr 94, pp. 125–127; the *third* edition did not appear until 1735, see *ibid.* nr 95, pp. 127–131. Before 1729 a reissue of the first edition appeared in The Hague in 1714, see *ibid.* nr 92, pp. 123–124, and a piracy edition appeared in 1723, probably in Basel, see *ibid.* nr 93, pp. 124–125.)

the investigation of truth but as a medium to further disputations.[30] By contrast, Le Clerc wants to present a logic that concerns the knowledge of things, not mere words.[31] He praises modern logicians who have conceived of logic as an art of invention and not as an art of talking. In addition to helping us in reasoning well, logic should also assist us in disentangling ourselves from the empty words of Aristotelian logicians: 'when we know what those words mean, there is less danger that they deceive us'.[32]

Le Clerc's logic has a structure that is largely in accordance with the quadripartite division of the *Port-Royal Logic* and there are many cases where he even follows its division into chapters. His treatise is divided into the following parts:

I. On singular ideas.
II. On judgements.
III. On method.
IV. On argumentation.[33]

Remarkably enough, Le Clerc has interchanged the third and the fourth parts of the *Port-Royal Logic*. He is well aware that he has intervened in a conventional order, but does not seem to mind the consequences:

> The third part teaches how one should arrange enunciations, so that truth can be found or, once found, how it can be taught. This disposition is usually called *method*. Finally, the fourth part teaches the art of arranging propositions, so that we are able to prove the truth to opponents. This is usually called *argumentation* or *the third mode of discoursing*. Some call method, which is here treated in the third part, *the fourth mode of discoursing*. Whether this name is admitted or rejected is of little consequence.[34]

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[30] Le Clerc, *Logica*, 'Præfatio', p. 2: 'Non ad investigationem veri, sed ad facilem tantum de omnibus disputationem, viam aperire studebant.'

[31] *Ibid.* 'Præfatio', pp. 4–5: 'Itaque in hac nostra Logica, ante omnia, præcepta, quibus non ad verborum, sed ad rerum cognitionem perveniri queat, trademus.'

[32] *Ibid.* 'Præfatio', p. 6: 'ubi scimus quid significent voces istæ, periculum minus est ne nobis imponant'.

[33] *Ibid.* 'I. De Singulis Ideis', 'II. De Judiciis', 'III. De Methodo', and 'IV. De Argumentatione'.

[34] *Ibid.* 'Præfatio', p. 5: 'Tertia Pars tradet, qua ratione disponi oporteat Enunciationes, ut veritas inveniatur aut inventa traditur, quæ dispositio *Methodus* dici solet. Quarta denique docebit artem disponendi propositiones, ut veritatem contradicentibus probemus, quod *Argumentationis* nomine designari, & *tertius disserendi modus* vocari solet. Quidam Methodum, de qua in tertia Parte agetur, *quartum disserendi modum* vocant; quod seu admittatur nomen, seu rejiciatur, perinde est.'

His decision to relegate peripatetic syllogisms to the fourth part while assigning the third part to method can be seen as a way of giving structural expression to a marginalization of syllogisms that had already started in Arnauld's logic. One consequence of this interchange is that method is no longer presented as pertaining to the order of syllogisms, but rather to the order of judgements.[35] In this way Le Clerc can present method as a natural sequel to a two-stage logic of ideas, while syllogisms are treated in the last part that is hardly more than an appendix. Le Clerc discusses syllogisms because it is customary to do so in a logical textbook, not at all because he regards them as paying any vital contribution to logic. Syllogisms are of little use at best, that is to say when they are true.[36] In the worst case they are based on wrong assumptions that consist of mere obscure phrases.[37] Le Clerc's conventional discussion of syllogisms contains little of note and it can be safely discarded.[38] I shall concentrate instead on the first three parts of the *Logica*, dealing with ideas, judgements and method.

5.4. *Ideas*

The first part of Le Clerc's logic is preceded by a 'Præfatio de Origine, Natura, Usu & Divisione Logicæ' and then proceeds with a discussion of ideas that is largely inspired by the five ways in which ideas had been discussed by Arnauld in his *Logique de Port-Royal* (see above, §3.1). In chapter ix. of part I, Le Clerc discusses the importance of the clarity of ideas, as a condition for subsequently making

[35] *Ibid.* I. i, p. 95: 'Postquam Perceptiones nostras simplices, itemque varia Judiciorum nostrorum genera contemplati sumus, & docuimus qua rationa circa ista, ut vitetur error, versari necesse sit; superest qua ratione judicia nostra debeant disponi, ut tutius ac citius veritatis cognitionem perveniatur, ostendamus. Atque hæc Logices Pars *Methodus* à Dialecticis dici solet; & paucis tractatur, præ ea parte in qua de *Syllogismo* agitur, quod haud paulo plus in animo ad disputationem, quam ad veritatis indagationem, muniendo laborent.'

[36] *Ibid.* 'Præfatio', p. 3: 'vera quidem ea ut plurimum, sed fere inutilia'.

[37] *Ibid.* IV. v, pp. 156–157.

[38] See Howell, *Eighteenth-Century British Logic*, p. 304: 'His [Le Clerc's] treatment of the syllogism is conventional ... It is not likely that he would have remained undisturbed in his discussion of these crucial matters if he had studied the full final text of chapter xvii of book IV of the *Essay*. But the version of that chapter in the epitome is not such as to make the syllogism appear to need drastic reconsideration.' See however below, §5.6, note 73.

certain judgements.[39] He follows Arnauld in declaring that is not necessary to distinguish between the clarity and distinctness of ideas and he even uses the term 'distinct' in the definition of the term 'clear'.[40] However, his account of what kind of ideas are capable of being clear represents a departure from Arnauld's logic. The latter had started in Cartesian fashion with the clear idea of oneself, of extended substance of being, existence, number and of God and then proceeded with the confused and obscure ideas of sensible qualities. Le Clerc on the other hand starts right away with a Lockean account of sensitive ideas.[41]

Indeed, Le Clerc infuses the framework of Arnauld's logic with Lockean influences. In *Logica* I. ii he gives a clearly Lockean discussion of simple ideas and complex ideas. In the next two chapters he discusses the ideas of substances, modes and relations. Yet although this triplet in itself is clearly Lockean,[42] Le Clerc's distinction between substances and modes is nevertheless conventionally Aristotelian; substances exist by them selves, whereas modes exist only in substances.[43] Here Le Clerc seems to have followed the lead of Arnauld rather than that of Locke. Le Clerc discusses substances, modes and relations in an order that runs parallel to Arnauld's equally conventional treatment of *choses* (i.e. substances) and *manieres de choses* (i.e. modes, attributes or qualities). The taxonomy of both Arnauld and Le Clerc is followed immediately by a chapter in which they feel obliged, with manifest aversion, to present the traditional ten categories of Aristotle (consisting of substance and nine accidents).

Le Clerc's empiricist logic is pervaded by what can be called Locke's 'substantial agnosticism'. Locke had maintained that a man can have no idea of pure substances in general 'but only a Supposition of he knows not what support of such Qualities, which are capable of producing simple *Ideas* in us; which Qualities are commonly called Accidents'.[44] In a very similar vein Le Clerc describes substances as 'I do not know what unknown subjects, in which cer-

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[39] *Ibid.* I. ix, p. 34: 'Ut de idea aliqua certum feramus judicium, ante omnia requiritur ut sit perspicua'.

[40] *Ibid.* I. ix, p. 34: '*Clara* dicitur idea, cum quicquid complectitur nobis distincte animo observatur, ita ut ab omnibus aliis facile distingui queat.'

[41] *Ibid.* I. ix, p. 34: 'Claræ sunt omnes ideæ simplices, quales sunt sensationes.'

[42] Locke, *Essay*, II. xiii, pp. 166–181.

[43] Le Clerc, *Logica*, I. iii, p. 13: 'Concipimus enim omnia, aut quasi seorsim & per se; aut in aliis existentia, ita ut sine illis existentiam hisce tribure nequeamus. Priora *Sbustantias* & *Subjecta*, posteriora *Modos*, & *Accidentia* vocamus.'

[44] Locke, *Essay*, II. xxiii. 2, p. 295.

tain qualities constantly coexist'.[45] For Le Clerc this definition is the point of departure for numerous attacks on a basic error to which, he feels, both Aristotelians and Cartesians are prone, i.e. the error of unduly apodictic knowledge claims concerning both material and spiritual substances.[46] He states that the Cartesian concept of extended substance is 'a most obscure thing',[47] and he inveighs against the Cartesian notion of thinking as the essence of mind, since we are unable to penetrate into this essence.[48] Since neither spiritual substances nor material substances can be completely understood by men, it follows that men are not able to create a perfect theology or a perfect physics.[49] On this point not only Aristotelians, but also *recentiores ipsi* (that is to say Descartes and his followers) have lapsed.

The most substantial difference between Le Clerc on the one hand and Arnauld and Malebranche on the other, is that between the Lockean epistemology of the former and the Cartesian epistemology of the latter two. These differences are illustrated by their diverging positions on primary and secondary qualities. (Although these terms are Lockean, the distinction itself is, of course, older, and was shared by Descartes and other mechanicist philosophers.) Arnauld points out that we can have clear ideas of movement, duration and number ('primary qualities' in Locke's vocabulary), but we have already seen (§3.1) that according to the Frenchman colours, sounds and smells (which in Locke's parlance are 'secondary qualities') provide us only with confused and obscure ideas. This is because custom has lead us to believe that these secondary qualities exist not only in our minds but also in the objects that we perceive with our senses. We tend to think that the pain caused by a needle exists in the needle itself. For Arnauld this error is an instance of the dubious reliability of sensitive perception in general.[50] A similar but more careful point is made by Malebranche, who stresses that we are lead astray not so much by our senses as by a wrong use of our liberty, which results in rash judgements; however, we are especially prone to this error

[45] Le Clerc, *Logica*, I. iii, pp. 14–15: 'subjecta nescio quæ ignota, in quibus quædam constanter coëxistunt proprietates'.

[46] See however Arnauld, *Logique*, IV. i, p. 292: 'Qu'il y a des choses que l'esprit humain est incapable de savoir' (part of title of chapter).

[47] Le Clerc, *Logica*, I. iii, p. 15. See also *ibid.* I. ix, p. 36.

[48] *Ibid.* I. vii, p. 29 'nos revera in intimam Mentis essentiam penetrasse, non sequitur'. See also *ibid.* I. x, p. 40.

[49] *Ibid.* III. v, p. 114: 'sequitur neque Theologiæ, neque Physices ullum Systema perfectum posse ab hominibus fieri'.

[50] Arnauld, *Logique*, I. ix, pp. 70–76.

in the case of sensitive ideas.[51] Le Clerc is not blind to the error of supposing that there is something outside us corresponding to the ideas of secondary qualities in our minds,[52] and he stresses that we should do our best not to fall into this trap. The very ideas that are treated with so much suspicion by Arnauld, however, such as ideas of colours and sounds, are regarded as simple sensitive ideas by Le Clerc, who considers these ideas basic and vital elements in his epistemology. According to him such ideas are not at all obscure. Rather, having given his definition of what amounts to a clear idea, he continues with the remark that all simple ideas are clear in so far as they are sensory perceptions of light, sound, smell and taste,[53] and the liveliness of these ideas is taken as a measure of their clarity.[54] In Le Clerc's Lockean epistemology the point of secondary qualities is not that they have to be mistrusted because they are sensorial, but rather that they remind us of the divide that exists between the ideas in our mind and the inaccessible essence of material substances in the external world.

Since Le Clerc uses the structure of Arnauld's Cartesian logic of ideas to present an epistemology that is clearly more empiricist than Cartesian, one would expect him to follow Locke in his criticism of innate ideas. To be sure, at the start of his *Logica*, Le Clerc echoes Locke's statement about ideas coming either from sensation or reflection, when he states 'that all ideas originate in the senses and in meditation' (although the term 'meditation' is more Cartesian than Lockean).[55] He claims that he could easily prove this tenet, if his logic would have been the right place to do so.[56] He shows a similar restraint after contending that we are able to perceive the relation between two abstract ideas 'by simple intuition', so that it is not necessary to assume that these ideas are innate: 'we would show the falsity of this [point] with the requisite arguments if this would be the right place [to do so]'.[57] Le Clerc's succinctness *vis-à-*

[51] Malebrache, *Recherche*, I. v, vol. I, p. 77; see also *ibid.* VI. II. ii, vol. II, pp. 302–304.

[52] Le Clerc, *Logica*, I. ii, p. 11.

[53] *Ibid.* I. ix, p. 34: 'Ita sensatio lucis ejusmodi est, etenim cum ea percellimur, quicquid in ea est videmus, nec eam cum ulla alia idea confundere possumus. Idem dixeris de sonitu, de odore, de sapore, de voluptate, de dolore &c. quæ nunquam invicem confunduntur.'

[54] *Ibid.* I. ix, p. 34: 'Atque hæ quidem sensationes eo clariores sunt, quo vividiores; cum enim vehementius Mens percellitur, magis attendit & clarius ejusmodi ideam vividam ab omnibus aliis distinguit.'

[55] *Ibid.* I. i, p. 7: 'omnes ideæ originem ... habere in sensibus & meditatione'.

[56] *Ibid.* I. i, p. 7: 'Facile hoc posset probari, si res esset cujus loci.'

[57] *Ibid.* III. xi, p. 134: 'imò falsum hoc esse necessariis argumentis ostenderemus,

vis the thesis of innate ideas is not caused by any deficit in reasons; he provides Lockean arguments against innate ideas readily enough in the *Pneumatica*, I. v. Why, then, does he repeatedly decline to give these arguments in his *Logica*? After all, Arnauld had used his *Logique* for giving arguments for the innateness of (at least many) ideas and against the dictum *Nihil est in intellectu quod non prius fuerit in sensu.* Perhaps Le Clerc understood that his defence of an empiricist logic of ideas did not require the kind of massive attack against innate ideas that had been launched by Locke in the first book of his *Essay* and to which Le Clerc referred explicitly in the *Pneumatologia.*[58] I have already suggested (see §3.3) that even Locke himself agreed that the debate on innate ideas is not essential for the outlines of his logic of ideas. For the justification of an empiricist epistemology it is enough to show that sensitive ideas can terminate in true knowledge. This is what Le Clerc tries to do in the first part of his logic and he is able to acquit himself of this task without proving explicitly that no innate ideas whatsoever exist.

5.5. *Judgements*

Le Clerc's discussion of judgements in the second part of his logic largely follows the pattern and contents of Arnauld's logic. However, in this part Le Clerc again makes some interesting departures from the example of the *Logique.* Arnauld, in his treatment of judgements, hardly bothers to make a distinction between different kinds of knowledge and of certainty. This is not surprising, once we appreciate a Cartesian background in which a major role is played by the ideal of the unity of all philosophical knowledge, which for Arnauld seems to preempt the need of distinguishing between various kinds of knowledge. Le Clerc, by contrast, includes a complete chapter 'On the various degrees of clearness and probability in propositions.'[59] In this chapter he makes a distinction between science and judgement, which coincides with the fundamental distinction

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si res esset hujus loci'.

[58] Le Clerc, *Pneumatologia*, I. v, p. 49: 'Nec pluribus rem persequemur, quoniam ex dictis satis liquet, & qui plura volent eos adire poterunt qui quæstionem hanc integris libris excutiendam susceperunt.' Followed by footnote: 'Vide Opus Anglicum *Joan. Locke* inscriptu *Tentamen de Intellectu*, Lib. I.'

[59] Le Clerc, *Logica*, II, viii, p. 64: 'De variis Perspicuitatis in Propositionibus gradibus, & Verisimilitudine' (title of chapter).

between knowledge and opinion made by Locke in book IV of the *Essay*. Where Locke had distinguished two faculties of the mind that are conversant about truth and falsehood:

> *First, Knowledge*, whereby it certainly perceives, and is undoubtedly satisfied of the Agreement or Disagreement of any *Ideas*. *Secondly, Judgment*, which is the putting *Ideas* together, or separating them from one another in the Mind, when their certain Agreement or Disagreement is not perceived, but *presumed* to be so ...[60]

Le Clerc in a similar way defines science as 'knowledge taken from the introspection of the thing concerned, which itself excludes any doubt. This can originate from the simple intuition of ideas'.[61] On the other hand, he defines opinion as the agreement of the soul to propositions that are not intuitivily true and that only 'seem to display the appearance of truth'.[62] Given Le Clerc's commitment to an empiricist epistemology, and given his Lockean substantial agnosticism, it is important for him to recognize probable knowledge as a legitimate category.

5.6. *Method*

In the third part of his *Logica*, Le Clerc addresses the subject of method. Following Arnauld's pattern (see above, §3.1), he gives a general discussion of the analytical and synthetical methods. He notes that these procedures are comparable to a genealogical investigation; in the cases of analysis we go from descendant to ancestor while the reverse direction is taken in the case of synthesis.[63] There is no difference in principle between these methods, however, in so far as both start with what is known in order to gain knowledge about what is not yet known and in so far as they take into account only propositions that are evident.

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[60] Locke, *Essay*, IV. xiv. 4, p. 653.

[61] Le Clerc, *Logica*, II, viii, p. 64: '*Scientia* est cognitio ex ipsius rei, de qua agitur, introspectione petita & quæ omnem dubitationem excludit. Potest autem oriri ex simplici intuitione idearum.'

[62] *Ibid.* II, viii, p. 64: '*Opinio* est assensus animi Propositionibus non evidenter primo intuitu veris, neque ex veris per necessariam consequentiam deductis, sed quæ speciem veri præ se ferre videntur, præbitus.'

[63] *Ibid.* III. i, p. 96: 'Hæ methodi inter se eodemmodo differunt, ac differrent rationes inquirendæ Genealogiæ discendendo à majoribus ad posteros; aut contrà, à posteris ad majores ascendendo.'

Le Clerc starts his discussion of method with three general axioms, which apply not only to analysis but to synthesis as well. The first axiom holds that when we reason, each step should be evident; the second that we should reason only about things of which we have clear ideas; and the third that we should always begin with the simplest and easiest things, and pause there before proceeding with more complex and difficult matters.[64] These general axioms are followed by seven rules that apply to analysis in particular.[65] Le Clerc's three general axioms are taken from Malebranche's general methodological principle and general rule (see above §3.2), and his seven analytical rules are an almost literal translation into Latin of Malebranche's six rules.[66] Le Clerc's seventh rule is: 'After this investigation we understand that all propositions that are of no use for the solution of the problem should be eliminated; concerning the remaining propositions we are to proceed in the same order as taught by the six previous rules.'[67] This rule can be found in the *Recherche* as well, not with a separate number, yet immediately after the sixth rule. Finally, while Le Clerc describes his seven rules explicitly as being 'analytical', Malebranche did not use this predicate; probably because he did not need to, since contrary to Le Clerc he does not discuss the opposite concept of synthesis.

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[64] The first axiom: 'In omnibus gradibus progressionem nostrarum, in ratiociniis, conservandam esse evidentiam.' The second axiom: 'Debere nos de iis tantum, quorum clara menti nostra obversantur ideæ; aut rebus obscuris, quatenus duntaxat sunt nobis notæ, ratiocinari.' The third axiom: 'Nos debere semper incipere à simplicibus & facilibus, & iis aliquandiu inhærere, priusquam ad composita & difficilia progrediamur.' Le Clerc, *Logica*, III. iv, p. 110.

[65] *Ibid.* III. iv, pp. 110–112: '1. Perspicuè intelligendum statum quæstionum propositarum', '2. Esse aliquo ingenii conatu retegendas unam aut plures ideas medias, quæ possint esse instar mensura communis, cujus ope invententur relationes, quæ intercedunt inter ideas comparandas', '3. Ut à re, quæ consideranda venit, omnia, quæ non necessario pertinent, ad investigatam veritatem, circumcidantur', '4. Quæstionem compositam dividi in partes, easque sigillatim expendi, co ordine ut ab iis incipiamus quæ simplicioribus constant ideis; nec unquam ad compositas deveniamus, nisi postquam simpliciores distinctè novimus, & faciles nobis consideratu [sic] meditatione effecimus', '5. Idearum quædam signa constitui figuris, aut verbis quam paucissimis comprehensa; eaque signa memoriæ imprimi, aut chartæ illimi, ne amplius circa hæc laboret Mens', and '6. Postquam quæ necessario in Quæstione consideranda sunt, ea nobis evaserunt dilucida, compendiosisque signis notata, & oridine disposita sunt, tum ideæ, juxta sextam Legem, invicem, aut solà meditatione, aut arrepto calamo & comparatione verbis expressa conferendas.'

[66] Malebranche, *Recherche*, VI. II. i, vol. II, pp. 295–299.

[67] Le Clerc, *Logica*, III. iv, p. 112: 'Abscindendas omnes Propositiones, quas ad Quæstionis solutionem inutiles esse, examine facto, deprehendimus; & in reliquis eodem ordine, qui sex prioribus Regulis traditus est, denuo procedendum.'

After his Malebranchean discussion of the analytical method, Le Clerc returns to Arnauld for a discussion of the synthetical method, whose five rules are translated to the letter.[68] Le Clerc's discussion of the analytical and synthetical method is limited in the sense that both methods pertain only to certain knowledge. One of the great accomplishments of Locke's *Essay*, however, had been that it did not concentrate solely on (certain) 'knowledge', but also on 'probability' (see above, §2.1). Locke's acceptance of probable knowledge is at the root of an epistemology and a method for the empirical sciences. His 'Historical, plain Method' formed a significant departure from such Cartesian works as, for instance, Arnauld's *Logique*. Since Arnauld's Cartesian ideal of a single demonstratively certain science seems to preclude attempts at developing a separate probabilistic *epistemology*, it is not surprising that he does not present a probabilistic or empiricist *method* either. Le Clerc, on the other hand, follows Locke in developing an empiricist epistemology and by making an explicit distinction between science and opinion. Thus one would expect Le Clerc to proceed with an empiricist method as well. Curiously enough, however, he fails to attach any inductive methodology to his empiricist epistemology. He confines himself to an account of the synthetical and analytical method as delivered by Arnauld and Malebranche. Le Clerc's admission 'that in the various disciplines there are some things that cannot be presented geometrically',[69] almost seems to cry out for an inductive alternative to the methods of analysis and synthesis. Yet there is nothing comparable to Locke's historical plain method in Le Clerc's *Logica*.[70] The reasons for this omission can only be guessed at. Perhaps Le Clerc simply failed to

[68] *Ibid.* III. ix, p. 128: 'Definitionum Leges sunt hæ: I. *Nullum vocabulum subobscurum, aut ambiguum sine definitione adhibere.* II. *In definitionibus nullis vocabulis, nisi notissimæ significationis, aut jam expositis, uti.* Axiomatum Lex est: *nihil Axiomatis instar, quod non sit evidentissimum, statuere.* Demonstrationibus hæ Leges positæ sunt: I. *Omnes Propositiones subobscuras probare, nec quicquam in iis demonstrandis adhibere, præter Definitiones constitutas, Axiomata concessa, Propositiones jam demonstratas, aut Constructionem figuræ, de qua agitur, ubi quid simile faciendum contingit.* II. *Nunquam abuti ambiguitate vocabulorum, iis non affingendo definitiones quibus exponuntur.*' Cf. transl. of Malebranche's rules in Buroker, p. 240.

[69] Le Clerc, *Logica*, III. xii, p. 140: 'quædam esse in variis Disciplinis, quæ nequeunt Geometricè proponi'.

[70] Le Clerc's methodological pursuits were more fruitful in the field of critical textual scholarship; see his *Ars critica* (1697), on which Pitassi, *Entre croire et savoir*, p. 92 writes: 'Le manuel de 1697 n'est pas seulement la synthèse la plus complète des différentes branches du savoir critique à la fin du XVIIe siècle; mais il est aussi une méthode rigoureuse inconnue à la tradition érudite.'

notice Locke's discussion of his plain historical method. Although this method is an important theme in the *Essay*, it is discussed in various places without being given a separate chapter. Moreover, in the introduction of his logic, Le Clerc mentions (his French translation of) the 'Epitome' of the *Essay*, rather than the *Essay* itself as a source of influence. Locke's most specific reference to his historical method is made in book I of the *Essay*;[71] and this book is not included in the 'Epitome'.[72] However, by the time Le Clerc had finished his *Logica* he had probably become acquainted with Locke's full account of his empiricist method in the *Essay* itself.[73]

Finally, while Le Clerc fails to give an inductive method, he does discuss the methodological device of attention. Before he proceeds to a more detailed scrutiny of the analytical and the synthetical method, he includes a chapter that is absent in the *Port-Royal Logic*. The title of this chapter III. ii is: 'On the necessity of attention and the means by which it can be obtained.'[74] In this chapter Le Clerc points out that we will obtain no clear ideas without attention, which implies a due and uninterrupted contemplation of the nature of the object that

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[71] Locke, *Essay*, I. i. 2, p. 44.

[72] Yet in his theological writings Le Clerc did discuss the method that belongs to the field of opinion and probability; see Kroll, *The Material World*, pp. 260–274.

[73] Le Clerc published the 'Extrait' in 1688; see above, §3.3, note 70. The *Essay* was published later, in London, and Locke, also by that time in London, received bound copies of the book on 3 December 1689 (OS) (see Nidditch, 'Introduction' to Locke, *Essay*, p. xv). Le Clerc's words in the epistle to the reader of his *Logica*, p. [x] suggest that when he started work on this book he had not yet read the *Essay* itself: 'Cæterum ne in ingenuitatem peccemus, ingrative animi peccatum admittamus, eximio libro Anglicè scripto, cui *Tentamen de Intellectu* modestissimus idémque acutissimus Scriptor titulum fecit, plurima nos debere profitebimur. Cùm hæc primum scripsimus, ejus Epitomen videramus, ex qua multe disertè tradita hausimus'. Moreover, since Le Clerc himself prepared the 'Extrait' and since the shorter format of this treatise may have suited his aims better in preparing the equally short *Logica*, it is possible that Le Clerc preferred using the 'Extrait' rather than the *Essay* itself. However, the *Logica* was not in print until 20 January 1692 (see letter from Le Clerc to Locke with this date, Locke, *Corr.* 1446, IV, p. 354). Le Clerc was on Locke's list of persons that should be send a copy of the first edition of the *Essay* (see MS Locke c. 25, fol. 50r.); and indeed on 17 March 1690 Le Clerc thanked Locke for 'vôtre Livre', by which he probably meant the *Essay* (Locke, *Corr.* 1257, IV, p. 23). Finally, Le Clerc's *Bibliothèque Universelle et Historique*, 17 (1690) 399–427, gives a review of the (first edition of the) complete *Essay* itself; see Bots, 'Jean Leclerc as Journalist of the *Bibliothèques*', pp. 53–66. So, Le Clerc had probably supplemented his inspiration based on the 'Extrait' with the *Essay* itself, by the time that the *Logica* appeared in 1692.

[74] Le Clerc, *Logica*, III. ii, p. 99: 'De Attentionis necessitate, & subsidiis quibus comparari potest' (title of chapter).

we are investigating.[75] He then remarks that we find it easier to be attentive to those things that affect us by means of the senses, whereas most people have great difficulty in keeping their attention fixed on abstract ideas. The reason for this difference is that sensorial ideas of corporeal images are more lively than abstract ideas. He proposes to use the very liveliness of sensorial ideas as a means of deflecting our attention towards incorporeal objects. Mathematicians have shown that, when used diligently, this method can be very successful; children learn more easily by the use of images and figures than by mere words.[76]

In his letter to the reader, Le Clerc had already mentioned Malebranche as the source of his chapter on attention.[77] We have seen (§3.2) that the latter stresses the importance of attention, but we have not yet discussed the means by which Malebranche hopes to further this mental state. To this end, he considers the causes of the modification of our soul, i.e. the senses, our imagination, and our passions. These faculties tend to deflect us from an attentive meditation of the abstract ideas of the pure understanding. In spite of his rationalistic reservations, however, Malebranche sees no other possibility in furthering our attention than by a circumspect use of these very causes of modification: 'Nonetheless, as the soul cannot be without passions, sensation, or some other particular modification, we must make a virtue of necessity and draw even from these modifications assistance in making ourselves more attentive.'[78] He then gives an entire chapter on 'The use that can be made of the passions and the senses for preserving the mind's attention'.[79] In this chapter Malebranche concludes that 'sensations awaken our attention much more quickly than pure ideas. From this it is clear that the mind's lack of attention to truths that do not affect it can be remedied by expressing them by sensible things that do affect it.'[80] In the rationalist

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[75] *Ibid.* III. iii, p. 100: 'quæ nihil aliud est præter diuturnam, neque intermissam, aut alliis cogitationibus interpellatam ideæ cujuspiam considerationem'.

[76] *Ibid.* III. iii, p. 101: 'dum enim oculi in figuras defixi sunt, animus rem cujus sunt signa contemplatur'.

[77] *Ibid.* 'Ad Lectorem', p. [xi].

[78] Malebranche, *Recherche*, VI. I. ii, vol. II, p. 253: 'Cependant comme il n'est pas possible que l'ame soit sans passions, sans sentiment, ou sans quelqu'autre modification particuliére; il faut faire de necessité vertu, & tirer même de ces modifications des secours pour se rendre plus attentif.' Transl. Lennon, p. 413.

[79] Malebranche, *Recherche*, VI. I. iii, vol. II, p. 254: 'De l'usage que l'on peut faire des passions & des sens pour conserver l'attention de l'esprit.' Transl. Lennon, p. 414.

[80] Malebranche, *Recherche*, VI. I. iii, vol. II, p. 259: 'les sensations réveillent donc nôtre attention d'une maniére plus vive que les idées pures. Ainsi il est visible que

philosophy of Malebranche, the use of sensorial images in furthering our attention amounts to playing with fire, which has to be accompanied by explicit warnings of moderation and circumspection. For Le Clerc, on the other hand, this is an altogether unproblematic aspect of his empiricist logic. It is therefore remarkable to see Le Clerc proceeding with a Malebranchean anti-empiricist *caveat* that may be very relevant within the frame of the *Recherche*, but that looks distinctly out of place in the *Logica*: 'it is true that above all care should be taken to prevent the trouble that generally is wont to come about in the mind through the senses, the imagination or the commotions of passion'.[81] Here Le Clerc may have continued here to copy Malebranche for somewhat longer than was warranted by his own empiricist assumptions.

5.7. *Conclusion*

Consider the following fragments from a letter by William Molyneux to his friend John Locke on 22 December 1692; in this letter Molyneux suggests to Locke the possibility of infusing the content of the *Essay* into a traditional structure,

> that is by Way of Logick, something accommodated to the Usual Forms, together with the Consideration of Extension, Solidity, Mobility, Thinking, Existence, Duration, Number, etc. and of the Mind of Man, and its Powers, as may make up a Compleat Body of what the Schooles call Logicks and Metaphisicks ... a Large Discourse in the way of a Logick would be much more taking in the Universitys, wherein Youths do not satisfy themselves to have the Breeding or Business of the Place, unles they are ingaged in something that bears the name and Form of Logick.[82]

Locke himself did not at all like the suggestion of what he called 'turning my Essay into a body of logick and metaphysicks, accomodated to the usual forms'.[83] Since he was uninterested in academic respectability, his negative reaction is understandable. However, the

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l'on peut remedier au défaut d'application de l'esprit aux véritez qui ne le touchent pas, en les exprimant par des choses sensibles qui le touchent.' Transl. Lennon, p. 416.

[81] Le Clerc, *Logica*, III. ii, pp. 100–101: 'verum est ante omnia cavendum, ne inde nascatur incommodum, quod sequi animi per sensus, imaginationem, aut affectus commotiones ut plurimum solet'.

[82] Locke, *Corr.* 1579, IV, pp. 601–602.

[83] Letter from Locke to Molyneux, Locke, *Corr.* 1592, IV, p. 626.

eighteenth century would see various textbooks in which attempts were made to present the Lockean way of ideas in the tripartite format of Aristotelian logic.[84] Since Molyneux apparently continued to feel the need of accommodating the content of the *Essay* to the formal constraints of a textbook on logic after having mentioned Le Clerc's *Logica*, one can already guess that he did not think much of the latter's attempt in this direction. Indeed, in the same letter Molyneux gives the following stern verdict: 'I have Lately seen Johannis Clerici Logica, Ontologia and Pneumatologia, in all which He has little Extraordinary but what he Borrows from you; and in the Alteration he gives them he robbs them of their Native Beautys'.[85] However, it seems as if Molyneux was somewhat too severe. Although none of the elements of Le Clerc's *Logica*, when taken separately, is unique, the work makes a valuable contribution to the logic of ideas. Le Clerc was the first author to use the format of a traditional textbook for presenting a logic of ideas that has a Lockean empiricist rather than a Cartesian rationalist epistemology—if not yet an empiricist inductive method. Le Clerc's *Logica* makes a good example of the flexibility of the logic of ideas with respect to the *content* of an epistemology that could be rationalist or empiricist. Le Clerc's clearly Lockean sympathies often prompted him to criticize the physical, metaphysical and, especially, epistemological tenets of Cartesian philosophers. Yet in the last resort, Le Clerc perceived Arnauld and Malebranche as allies in a more fundamental battle against an Aristotelianism that was far from defeated by 1692. Moreover, as Aristotelian logic lingered on, the logic of ideas began to show signs of differentiation. The initial representatives of the new logic had all been agressively anti-Aristotelian. In the next chapter we shall for the first time encounter more irenic views in the camp of the *novatores*.

[84] Three English exemples are: Watts, *Logick* (1725); Duncan, *Elements of Logick* (1748) and Bentham, *An Introduction to Logick* (1773). See my 'General Introduction' to Locke, 'Conduct', pp. 90–95.

[85] Locke, *Corr.* 1579, IV, pp. 601.

CHAPTER SIX

JEAN-PIERRE DE CROUSAZ: ACCOMMODATION BETWEEN OLD AND NEW LOGIC (1725)

6.1. *Introduction*

Jean-Pierre de Crousaz (Latinized 'de Crosa') was born on 13 April 1663 to an aristocratic family in Lausanne. He studied theology at the academy of his native city and at Leiden University. He became professor in philosophy at the academy of Lausanne in 1700. In 1716 the city of Bern imposed the *Formula Consensus Helvetica*, which applied to Lausanne as well.[1] This strict formulation of the Calvinist creed prompted several Swiss intellectuals to take the road of exile. When Crousaz started to look for employment abroad he was not only looking for a milder religious climate but also for an institution that would help him to a wider international platform.[2] He received several offers but finally settled for the Dutch university of Groningen. His friend, the French Huguenot jurist Jean Barbeyrac (1674–1744), had prepared his way with a similar move from Lausanne to Groningen. Crousaz accepted the post of professor of philosophy and mathematics and arrived in his new country of residence in September 1724. His *ménage* included his wife, his two daughters, four students (one of which was his grand-nephew) and some servants. In addition to his busy academic activities he also a started a stud-farm, importing a dozen horses for the occasion. At first he wrote back to his friends in Switzerland exuberant letters about his new fatherland and its excellent beer, but things quickly started to turn sour. According to Barbeyrac, Crousaz behaved like a snob and treated his colleagues like fools. He insisted that his signature under the academic regulations should be followed by his aristocratic titles. He refused to attend a meeting of his faculty under the pretext that his philosophy was completely different from that of his colleagues. When, at another occasion, he finally deigned to at-

[1] See Vuilleumier, *Histoire de l'église réformée*, 3, *passim*.
[2] La Harpe, *Crousaz*, p. 58.

tend a meeting of the academic Senate, he discarded the austere black robe of a Dutch professor and appeared in the costume of a noble-man, wearing a magnificent red mantle and a sword, which he had lent for the occasion from Barbeyrac. Finally, he withheld permission for the marriage of his younger daughter Marie to a friend of Barbeyrac, on account of the fact that the young man was a mere commoner. When the couple sought, and obtained, refuge in the house of Barbeyrac, Crousaz broke with him as well. Given this string of unfortunate events, it does not come as much of a surprise that Crousaz left Groningen in March 1726 already, leaving behind not only his daughter but also twelve fine Spanish horses. By now aged 63, he obtained a position as tutor to the five-year-old son of the Landgrave of Hesse-Kassel. Eventually he would return to his post at the academy of Lausanne, where he died in 1750.[3]

Crousaz was a prolific writer whose interest in philosophy and mathematics had first been awakened by the works of Descartes. This influence did not hinder him from defending clearly empiricist views. His works can roughly be divided into three categories. First, there are philosophical works, such as the *Système de réflexions qui peuvent contribuer à la netteté & l'étendue de nos connoissances; ou nouvel essai de logique* (1712) and the *Traité du Beau* (1715); second, there are mathematical and physical writings such as *La Géométrie des lignes et des surfaces rectilignes et circulaires* (1718) and the *Discours sur le principe, la nature et la communication du mouvement* (1721); and finally he produced an array of polemical works against the supposed denial of human free will by Anthony Collins, against the 'fatalism' of Leibniz and Wolff, against the Pyrrhonism of Pierre Bayle and against the assumption of a vacuum and of *actio in distans* in Newtonian physics.

One of Crousaz's best-known works is the *Système de réflexions*, which from the second edition (1720) onwards was known as *La Logique ou Système des Réflexions*. This work was composed originally for the son of the Duke of Saxe-Merseburg. The mother of the young prince had been afraid that her son might be repelled by the ordinary treatises on logic. Yet the work is far from elementary. Crousaz continued to produce additions to the *Logique*, mainly in the form of ever more copious examples, so that by 1741 the fourth edition counted no less than six volumes. The two volumes of the

[3] *Ibid.* pp. 67–77.

second edition were translated into Latin (*Logicæ systema*), while the Englishman John Henley (1692–1756) produced an English translation (*A New Treatise of the Art of Thinking*) of the same edition. Both translations appeared in 1724. The number of editions and the translations suggest that the *Logique* was a widely read work. Edward Gibbon seems to have benefited from studying the work. Between 1753 and 1758 he lived in Lausanne, where he studied under the Calvinist minister Daniel Pavillard, who had been himself a student of Crousaz. In his autobiography Gibbon wrote about Crousaz:

> His System of Logic, which in the last editions has swelled to six tedious and prolix volumes, may be praised as a clear and methodological abridgement of the art of reasoning, from our simple ideas to the most complex operations of the human understanding. This system I studied, and meditated, and abstracted, till I have [*sic*] obtained the free command of an universal instrument, which I soon presumed to exercise on my catholic opinions.[4]

Although Crousaz spent a considerable part of his eighteen months in Groningen in bitter altercations, his productivity was by no means negligible. He had prepared his inaugural lecture, *De logicæ cum physica, et de matheseos cum utraque, ac utriusque cum mathesi reciproco nexu* (1724) already in Lausanne, but in Groningen he held two more orations, both on physics.[5] In addition, he prepared a Latin abridgement of his *Logique*, the *Logicæ compendium: in usum academiæ juventutis adornatum*, as well as an even shorter *Summa logicæ*, printed both in 1725. Groningen also saw the publication, in the same year, of his *Tentamen novum metaphysicum*, of an *Essay de rhétorique dans la traduction de quatre harangues de Tite-Live*, and of a theological treatise, *De la gloire de ceuxs qui connaissent l'Evangile et qui s'y soumettent*. I shall concentrate on the *Logicæ compendium*, and to a lesser degree on the *Summa*, which were both conceived for the specific use of Crousaz's students at Groningen university; in addition I shall also pay some attention to his inaugural lecture, *De logicæ cum physica ... nexu*, to the *Logicæ systema* and to *The New Treatise*, i.e. the Latin and English translations of the second edition of the *Logique*.

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[4] Gibbon, *Autobiographies*, p. 136, quoted in: Howell, *Eighteenth-Century British Logic*, p. 308.

[5] *De physicæ origine* (1724) and *De physicæ utilitate* (1725).

6.2. *Structure and Outline*

The *Logicæ compendium* is a dense treatise, written in the question-answer form of a disputation, in a rather opaque Latin that may have tortured Crousaz's students in Groningen. The work is divided into four books; the first part is without title and the remaining parts are on

II. Judgement
III. Reasoning
IV. Method[6]

This again suggests the familiar quadripartite format of Arnauld's *Logique.* The precise structure of part I, however, is remarkable:

I. Simple perception
II. Perceptions considered in relation to [their] objects
III. Ordering ideas in so far as they vary according to various ways of perception[7]

The first section discusses various faculties, with chapters devoted to intellectual perception, sensory perception, imagination and the will. The second section offers a basic ontology with a division into substances, modes and relations. Finally, the third section on the various ways of perception amounts to a taxonomy of ideas. The three sections of the first part together account for 126 of the 212 pages of the *Compendium* and form a curious example of double structural hybridism. Firstly, we have seen how Arnauld squeezed the content of his new logic of ideas into existing Aristotelian patterns of logical textbooks (see §3.1). Secondly, we have noted that, given the importance of the two interrelated elements of ideas and faculties, a logician of ideas could choose between two different structural approaches. One course, taken by Malebranche, was an organization of the new logic around the human faculties (see §3.2). The other possibility, preferred by Locke, was a format in which ideas are the basic units (see §3.3). Crousaz is unique in presenting a structure that is hybrid on both accounts. Firstly, he follows the example of Arnauld by maintaining the traditional quadripartite structure of a logical textbook, while crowding the first part of his *Compendium* with elements of the

[6] Crousaz, *Compendium*: 'II. De judicio', 'III. De ratiocinio' and 'IV. De methodo'.

[7] *Ibid.* 'I. De perceptione simplici', 'II. De Perceptionibus relatè ad Objectis [*sic*] condideratis' and 'III. Ideas dirigens, quatenus, pro diversô percipiendi modô variant'.

new logic. Secondly, by examining, in the first part, the faculties in a separate first section and by discussing ideas in a separate third section, he presents both the Malebranchean and the Lockean solution in one and the same book. Inevitably, the result shows signs of compositorial strain. Given the close relation between ideas and faculties, it is not surprising that sometimes Crousaz discusses problems in one section that he could have addressed in another section just as well. He is fully aware of the mutual interdependency of the content of the three sections of part I. Moreover, he points out that in the last resort not only the third section, on the various ways of perception, but also the first two sections, on the faculties and on objects, amount to different ways of making distinctions between ideas: 'Any diversity of ideas must arise either from the diversity of the faculties, or from the variety of [their] objects, or from the various ways in which the faculties contemplate their objects.'[8] Consequently, when, in good Arnauldian fashion, he matches the four parts of his logic with the four acts of the mind, he maintains that in the last resort the entire first part, in spite of its hybrid structure, pertains to ideas.[9]

The double hybridism of the structure of the *Compendium* chimes with a similar ambiguity in its content. We have seen that the adherents of the logic of ideas polemized against the old logic and presented the new logic as an alternative to Aristotelian logic. Crousaz's work from his pre-Groningen years contains similar anti-Aristotelian reflexes. For example, in *The Art of Thinking* (the 1724 English translation of the *Logique*) Crousaz is not surprised that logic is despised 'as an Heap of Nonsense' by those 'who confine this Name to what has hitherto been taught under it in the Schools'[10]. In the same work he writes:

> In the Schools, Men subtilised very much on certain Propositions ... Loss of Time! Superfluous Refinements! ... I own, I should be tempted to expose the Follies that amused the old Schools ... What they teach likewise about Oppositions, Contradictories, Contraries, Subcontraries, does not seem to me to be of any Service.[11]

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[8] *Ibid.* I. i. 2, p. 8: 'Omnis Idearum diversitas oriatur necesse est, vel à facultatis diversitate, vel ab objectorum varietate, vel ex diversis modis, quibus facultas objecta sua contemplatur'.

[9] *Ibid.* I. i. 1, p. 5: 'Mens enim ... percipit, sive rerum ideas apprehendit, breviter, (quidquid sint ideæ) perceptionibus quibusbam afficitur, quarum conscia, res ipsa cognoscere & intuiri sibi videtur.'

[10] Crousaz, *Art of Thinking*, 'Preface', vol. I, p. iii.

[11] *Ibid.* II. x, vol. II, pp. 189–190.

In Groningen, Crousaz initially continued in a similar vein, when in his inaugural lecture *De logicæ cum physica ... nexu* he castigated Aristotelian logic as 'A miserable art capable of turning young men that are still inexperienced, ignorant and simple, into smatterers, pedants, buffoons and senseless persons at one moment and into praters, haters and biters at another.'[12]

However, in the *Compendium* and also in the *Summa*, these anti-Aristotelian attacks have largely subsided. For instance, although Crousaz in *The Art of Thinking* had dismissed the four kinds of formal propositional oppositions (contradictory, subaltern, contrary and subcontrary) as useless, he gives an—admittedly brief—discussion of these Aristotelian concepts without any note of criticism in the *Compendium*.[13] In the *Compendium* and in the *Summa* he satisfies his polemic needs mainly by attacking scholastic form rather than Aristotelian substance. In the *Compendium* he censures the use of compendia for installing precepts that are learnt by heart without being understood.[14] And in the *Summa* he derides the sleepy doctors who bore their students by reading some lines from their compendia and then adding some redundant comments of their own.[15]

The change in Crousaz's tone is all the more remarkable for its swiftness; the transition took place somewhere between the time that he prepared his inaugural speech for Groningen while still in Lausanne, and the time when he reworked his *Logique* into the *Compendium* and the *Summa*, i.e. somewhere between the end of 1724 and the start of 1725. Given this timing, it is likely that events or circumstances that are connected with Groningen prompted the change. Jacqueline de la Harpe has pointed out that in Groningen Crousaz wanted to affirm himself not only as philosopher but also as a Calvinist preacher. Given this ambition, he thought it wise to flatter his influential and rather orthodox colleague professor Antonius Driessen (1684–1748) of the faculty of theology. Quickly, word reached back to his native Lausanne that, in order to placate Driessen, Crousaz had started to fill his books with the kind of scholastic jargon that

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[12] Crousaz, *De logicæ cum physica ... nexu*, p. 12: 'Ars infoelix adolescentes imperitos, ignaros, simplices, in sciolos, ineptos, fatuos & stolidos quandoque, quandoque etiam in garrulos, invidos, mordaces, commutare apta nata.'

[13] Crousaz, *Compendium*, II. 9, pp. 152–154.

[14] *Ibid.* 'Præfatio', p. [ix].

[15] Crousaz, *Summa*, 'Præfatio', p. [x]: 'Sedens nempe & oscitans Doctor, absque ullô incommodo, absque ullâ molestâ, ullaque gravi & contentâ attentione, legit Compendii aliquot lineas, quibus adjungit sæpè supervacanea.'

he had once ridiculed himself.[16] Thus it seems indeed possible to give a motive that is connected with Groningen for the sudden lull in Crousaz's anti-Aristotelian outpourings.

Given the ambiguity in both structure and content of Crousaz's logic, it is not surprising that posterity has hesitated about the exact label that should be attached to his work. Edward Gibbon confidently states that Crousaz's 'philosophy had been formed in the school of Locke';[17] Jacqueline la Harpe thinks that the two determining influences on Crousaz were both Descartes and Locke;[18] John Yolton considers Crousaz's logic 'a combination of Port Royal and Lockean concepts';[19] and Cornelis de Pater regards Crousaz primarily as a Cartesian who became more and more a follower of Leibniz[20]. What seems clear, however, is that Crousaz is a representative of the logic of ideas and that he considered himself to be part of this novel current. He made this point most clearly in the preface to the *Logica systema*, i.e. the 1724 Latin translation of the *Logique*, in words that bear a striking resemblance to similar contentions by Molyneux and Le Clerc (see above, ch. 1 and §5.1):

> In the last century, but quite gently and timidly, to be sure, the yoke of authority began to be shaken off. The hard fact is that no school adopted Verulam's *Novum Organum* or Descartes's *Method*. With happier consequences the *Ars Cogitandi* [the *Port-Royal Logic*] came upon the scene, and its repeated editions in our own century will justly arouse admiration. In that same era the most learned Clauberg was writing; a great many professors undertook publicly to explain his *Logic*. The most celebrated and most elegant author [Malebranche] of the work entitled *De Veritate Scrutanda* [*Recherche de la Vérité*] expounded the art of analysis more fruitfully than his predecessors had done, and brought to light the chief sources of the errors which stem from our affections. The most famous and most justly celebrated *De Intellectu Humano*, by Mr. Locke, is a distinguished work, the best thing that we have from him, and it will always be numbered among the most useful of logics. The truly outstanding Mr. Le Clerc, a man of immense industry and with a learning as solid as it was vast ... published a logic crammed to the top with the choicest observations of friendly witnesses, and splendidly furnished with original things[21]

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[16] La Harpe, *Crousaz*, p. 75.

[17] Gibbon, *Memoirs of My Life*, pp. 72–73, quoted in Pocock, *Barbarism and Religion*, vol. I, p. 74.

[18] La Harpe, *Crousaz*, pp. 207, 241.

[19] Yolton, *Perceptual Acquaintance*, p. 115.

[20] De Pater, 'Nicolaus Engelhard', p. 146.

[21] I did not manage to get hold of a copy of the *Logica systema*; the present quotation is a translation taken from Howell, *Eighteenth-Century British Logic*, pp. 326–327.

In the next sections we shall encounter many of these names as sources of influence on Crousaz's logic.

6.3. *Faculties*

The first section of the first part of the *Compendium*, on simple perception, starts with a 'Proemium' on logic in general. The dedication of the *Compendium* reminds us that this work was written at a time when the art of logic was slowly decaying. Crousaz complains that when he offered the original French version for publication, his (Dutch) publisher asked for some other title than 'logic'.[22] In view of this background of decline, it is not surprising that Crousaz feels obliged in the 'Proemium' to stress the use of logic in helping us to distinguish truth from falsehood. Crousaz admits that often we are very well able to make this distinction 'by the sheer fertility of the mind',[23] without the use of the rules of any artificial logic. This distinction between natural and artificial logic can also be found in Locke's *Essay*. However, Crousaz does not agree at all with Locke's radical rejection of artificial logic, on the contrary; he holds that natural logic can benefit from artificial logic in the same way as nature in general can be perfected by art.[24] Principles taken from artificial logic can help us to overcome controversy and doubt. In the *Art of Thinking* his defence of artificial logic brings him to the following paradoxical view: 'It is necessary that what we call *Artificial Logic* should become in us *Natural Logic*. The bare Knowledge of Rules could never produce this Effect: It is by the Use we make of them, that we learn to manage them, and form our selves to an Habit of employing them to the best Advantage.'[25]

Crousaz's discussion of the faculties in section i of part I of the *Compendium* contains chapters on the intellect, sensory perception, imagination and the will, followed by a chapter on the importance of attention, and clearly follows the pattern of Malebranche's *Recherche*. Crousaz starts the *Compendium* I. i. with a Cartesian evaluation of the intellect, which provides us with a form of knowledge that is superior to other kinds of knowledge, because it is sharper, purer and univer-

[22] Crousaz, *Compendium*, 'Dedicatio', p. [ii].
[23] *Ibid.* I. i. 1, p. 2: 'sola ingenii foeliciate'.
[24] *Ibid.* I. i. 1, p. 3: 'Scis naturam perfici ab arte, cujus parens est'.
[25] Crousaz, *The Art of Thinking*, vol. I, p. vii.

sal.[26] He then continues, in one of his compositorial inconsistencies, with a discussion of the method that is associated with intellectual knowledge, although part IV would have been a more suitable place for a methodological discussion. Intellectual knowledge can be obtained by following the precepts of Cartesian doubt; 'by such exercise the intellectual faculty will be invigorated'.[27] The accent here, however, is on didactical exercise and less on the generation of new knowledge. Crousaz, who was also a professor of mathematics, adds that the study of algebra is another way of exercising the intellect.

When Crousaz turns from intellectual to sensory perception, he makes the Malebranchean point that perceptions should be carefully distinguished from judgements, and that we tend to describe errors to perception that are in fact errors of judgements.[28] Yet Crousaz is clearly less sceptical about sensory perception than Malebranche. He is in no doubt that our senses can inform us about the existence of the external world.[29] The senses often deceive us, but it is possible to formulate methodological rules that will keep us from error. Crousaz first formulates three conventional rules: the sensory organs must be in perfect order; the distance between senses and object should be right; and the object should be in a convenient position.[30] In addition, the object should be observed by more than one sense; it should be observed from several sides; and it should be observed by different persons. These rules apply especially to bodies that can be readily perceived by our senses. However, Crousaz admits that often physical effects flow from causes that cannot be directly apprehended by our senses. In that case we need to take recourse to experiments, and this prompts him to formulate six more methodological rules. First, we must start our experiments with what is very simple and very obvious. Second, we should make the parsimonious assumption that nature is nothing but a mechanism that achieves with minimal effort what we can imitate only with the greatest possible trouble. Third, experiments should be repeated, so that we know which phenomena are and which are not fortuitous. Fourth, experiments should

[26] Crousaz, *Compendium*, I. i. 3, p. 10: 'est celerrima, est purissima, est maximè universalis'.

[27] *Ibid.* I. i. 3, p. 11: 'talique exercitio robur acquiret *Facultas Intellectualis*'.

[28] *Ibid.* I. i. 4, p. 15, cf. Malebranche, *Recherche*, I. xiv. iii, vol. I, pp. 160–161.

[29] Crousaz, *Compendium*, I. i. 4, p. 18: 'Crassiorem quod attinet cognitionem, quâ, mole conspicua corpora, à se invicem certô discernantur, ex sensibus haud dubiè comparatur.'

[30] *Ibid.* I. i. 4, p. 18; see also *The Art of Thinking*, I, p. 45: 'The Schools give three Rules'.

be extended, so that we learn that what is true in some cases is true in most cases. Fifth, experiments should be varied, so that we can test the assumption that something is indeed the cause of a certain effect. Sixth, they should be transferred, i.e. time and place should be changed, again with the aim of testing the validity of certain causal assumptions.[31] The first rule echoes the third of Descartes's four rules in the *Discours* (see above, §2.5) The second rule clearly affirms Crousaz as a representative of a mechanicist physics. Rules three through six provide the rudiments of an inductive method. Taken together, these rules amount to a pragmatic recipe for empirical investigation that cannot be reduced to any one of Crousaz precursors in the logic of ideas.

Crousaz continues his discussion of the faculties with the imagination. Perceptions of the imagination are perceptions that are connected with and depend on the affections of our body.[32] The faculty of imagination is influenced by factors that can all help us or hinder us in our quest for knowledge. Imagination is influenced by the four temperaments, by our gender, age, diet, loneliness or sociability and by various habits that deflect us from making correct judgements. Remedies against an undue influence of these factors should be sought in our reason. Some of the factors that influence the imagination also figure in Malebranche's discussion of this faculty, for instance that of gender. Malebranche's remark about the inability of women to get to the bottom of complicated questions is matched by Crousaz's observation that women are incapable of following the connection between the various links of a complicated argument.[33] However, Malebranche (following Descartes) had tried to put his psychology on a modern footing by invoking the mechanistic notion of 'animal spirits'. This concept plays a vital role in his analysis of the imaginative faculty:

> this power of the soul to form images includes two things, one depending upon the soul itself, the other upon the body. The first is the action and the command of the will. The second is the obedience rendered to it by the animal spirits that trace these images, and by the brain fibers on which they must be imprinted.[34]

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[31] Crousaz, *Compendium*, I. i. 4, pp. 20–21.

[32] *Ibid.* I. i. 5, pp. 21–22: 'Perceptiones *Imaginatricis* facultatis, mihi sunt omnes, quæ *cum affectione corporis conjunguntur, & ab affectione corporis pendent.*'

[33] Malebranche, *Recherche*, II. II. i, vol. I, pp. 266–268; Crousaz, *Compendium*, I. i. 5, pp. 26–27.

[34] Malebranche, *Recherche*, I. II. i, vol. I, pp. 193: 'que cette puissance qu'a l'ame de former des images renferme deux choses; l'une qui dépend de l'ame même, &

There is nothing of this in Crousaz, whose extensive discussion, 50 years after the *Recherche*, of the sanguinic, bilious, melancholic and phlegmatic temperaments, in spite of his professed sympathies for a mechanistic worldview, makes a decidedly outdated impression.

6.4. *Objects*

In the second section of part I of the *Compendium*, Crousaz discusses perceptions in relation to their objects. When the mind turns to external objects, it contemplates their substance or their accidents.[35] Crousaz prefers the term mode to accident because—and here he makes a remark with strong Lockean and anti-Aristotelian overtones—the word 'accident' *videtur supponere entitates nescio quas.*[36] An elaboration of this point can be found in *A New Treatise*, were we read that the word 'accident'

> gives occasion to fancy that Accidents befall a Substance, and tend towards it. And indeed they have been represented in the Schools, as certain Realities different from the Substance; but at the same time so imperfect, and wanting so much Reality, that in order to subsist they must have some Help, and be supported buy a subject which receives them. But such Words afford no clear Idea.[37]

In addition to substances and modes, Crousaz mentions relations as a third major category. This amounts to the familiar Lockean triplet of substances, modes and relations. However, just as Le Clerc (see above, §5.4), Crousaz does not fill the framework of this Lockean distinction with Lockean meaning. Rather, again like Le Clerc, he continues to use the Aristotelian distinction between a thing existing by itself or existing in something else for the distinction between substance and mode.

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l'autre qui dépend du corps. La premiére est l'action, & le commandement de la volonté. La seconde est l'obéïssance que lui rendent les esprits animaux qui tracent ces images, & les fibres du cerveau sur lesquelles elles doivent êtres gravées.' Transl. Lennon, p. 88.

[35] Crousaz, *Compendium*, I. ii. 2, p. 53: 'Mens nostra quandò rem extra se existentem contemplatur, cogitat *vel* de re propria dicta sive substantiâ, *vel* de accidentibus, vel de re modificatâ, accidentibus suis vestitâ.'

[36] *Ibid.* I. ii. 3, p. 56: 'videtur supponere entitates nescio quas, rebus supervenientes, umbratilia entia, tenuia, propemodùm evanida'.

[37] Crousaz, *New Treatise*, I. ii. 1, vol. I, p. 295.

Crousaz's subsequent treatment of substance and mode is decidedly Cartesian. There are two kinds of substance: thinking and extended substance. We have knowledge of thinking substance through an awareness of our own mind. Rather surprisingly, Crousaz's views on material substance are expressed most clearly not in his treatment of substances, but in his discussion of modes. He starts with the observation that distinctions between substantial and accidental modes are not very enlightening—which is about as far as his anti-Aristotelianism goes in the *Compendium*. He then observes that the term 'attribute' is often used imprecisely, whereas in truth the attributes of bodies fall into five distinct categories: *Mensuram, Quietem, Motum, Posituram, Figuram*.[38] These are the primary qualities of mechanistic physics. Whereas Arnauld and Le Clerc had still felt obliged to give a (critical) discussion of the Aristotelian categories, Crousaz is more radical in that he only gives the qualities that are valid in the the new physics. However, his anti-Aristotelianism is rather discrete in that he does not attack, but simple omits what he does not like. Thus, when he analyses the concept of equality he again subscribes to mechanicist physics; as criteria for judging the sameness or difference of material objects he uses the primary qualities of quantity and measure.[39] Similarly, although in the chapter on matter and form he subscribes to the Aristotelian notion of form as that 'by which something is principally that what it is',[40] this contention is given a distinctly, if again tactfully, mechanistic turn. Matter consists of corpuscles and form results from the position and motion of these particles.

The third category in Crousaz's Lockean triplet comprises relations. He makes a distinction between relations of objects with respect to us and relations of things between themselves. On the first category Crousaz remarks that objects related to us can be accommodated to our understanding, but it is also possible that they are too elevated or too tiny. We should not waste time on these objects that are beyond our understanding, and 'nothing seems more shameful than to dispute violently about what one does not understand'.[41] This recalls the Ciceronean motto of Locke's 'Conduct': 'what is so ill-considered or so unworthy of the dignity and serious-

[38] *Ibid.* I. ii. 3, p. 58.

[39] *Ibid.* I. ii. 7, pp. 70–71.

[40] *Ibid.* I. ii. 13, p. 83: 'per quod res aliqua est præsertim id ipsum quod est'.

[41] *Ibid.* I. ii. 5, p. 62: 'nihil turpius videatur quàm de non intellectis acriter disputare'.

ness proper to a philosopher as to hold an opinion that is not sure or to maintain with unhesitating certainty a proposition not based on adequate examination, comprehension and knowledge'?[42] Second, there are relations between things themselves. This heading provides Crousaz with a conveniently loose category that enables him to discuss similes, equality, dependence and independence, whole and part, subject and adjunct, matter and form, and cause and effect. Nowhere does he use scholastic terms with greater frequency than in this section. Relations of difference are divided in diverse and opposite, disparate and contrary, and in contradictory and privative. In the chapter 'On whole and part' he makes the distinction between homogenous and heterogeneous whole and between essential, integral and accidental whole. And in the chapter on subjects and adjuncts (i.e. non-essential attributes) he distinguishes between antecedent, concomitant and consequent adjuncts. The incidence of Aristotelian terms in these chapters is indeed higher than the terminology in the parallel chapters of *A New Treatise*, which lends further credence to the hypothesis that Groningen may have prompted Crousaz to couch his logic in terms which were more friendly to the peripatetic tradition.

There is more in *Compendium* I. ii that points to an Aristotelian content, but this content does not belong to logic proper, at least not in an Aristotelian sense. We can find discussions of relations, unity, whole and part, causes, subjects and adjuncts, substance and accident in many Aristotelian works, for instance those of Franco Burgersdijck; not however in his logic, but rather in his *Institutiones Metaphysicæ*. The new logic of ideas had a tendency of annexing areas that had belonged previously to metaphysics or, more specifically, to ontology. This trend did not start with Crousaz. Encroachments by logic on ontology were inevitable as soon as discussions about subject and predicate were complemented with analyses of substance and accident (or mode). This broadening of topics is already present in Arnauld's *Logique*, where the first part on ideas includes a chapter (I. 2) on 'Ideas considered according to their objects', which gives rise to a discussion of substances and modes. The line between an epistemological taxonomy of ideas, and an ontological taxonomy of the things that are represented by these ideas was not only thin, but

[42] Locke, 'Conduct', p. 151: 'Quid tam temerarium tamque indignum sapientis gravitate atque constantiâ, quam aut falsum sentire, aut quod non satis explorate perceptum sit et cognitum sine ullâ dubitatione defendere?' Cicero, *De natura deorum*, I.1. Transl. Rackam.

sometimes rather arbitrarily as well. The latter point is illustrated by Le Clerc, who on the one hand discusses ideas of substances and modes in his *Logica*, while on the other hand—contrary to Crousaz—still reserving whole and part, cause and effect, and subject and adjunct to his *Ontologia*.

6.5. *Ideas and Sensations*

The third and last section of part I is on ideas and sensations. Whereas for Locke there are no perceptions without ideas, Crousaz makes a distinction between perceptions that are ideas and perceptions that are not ideas but mere sensations. A sensation, for instance of pain or hunger, has no object but itself. An idea signifies both itself and something else, i.e. the object of which it is an idea.[43] The point of Crousaz's distinction is that we should not take sensations for ideas, i.e. we should not postulate the existence of things outside us that are in truth mere sensations in our minds. He uses this distinction between ideas and sensations for the distinction between primary and secondary qualities. Whereas our ideas of extension, figure an place correspond with qualities in bodies outside us, our sensation of redness or of pain does not correspond with any quality of redness or pain in any external object. Crousaz follows Descartes (see above, §2.4) and Malebranche in the sense that both deny that every perception is an idea. Moreover, in Malebranche we find exactly the same correspondence between ideas and primary qualities on the one hand and between sensations and secondary qualities on the other.[44] Malebranche, however, uses this distinction in the context of his point that we see all ideas in God. Our ideas (of the primary qualities) of material bodies outside us are not occasioned by these bodies but by God (see above, §3.2). By contrast, we have already seen that Crousaz defends a diligent empiricism in which material bodies will reveal their primary qualities directly to our senses (i.e. not through

[43] Crousaz, *Compendium*, I. i. 2, p. 7 on sensations: 'ut præter se ipsos nihil notificent'; on ideas: 'actusque sui conscii, ut præter se, aliquid à se diversum notiscent'.

[44] Malebranche, *Recherche*, II. ii. v, vol. I, p. 433: 'Il est certain que l'ame voit dans elle-même & sans idées, toutes les sensations & toutes les passions dont elle est actuellement touchée' and *ibid.* III. ii. vii, vol. I, p. 450: 'je veux dire, que l'idée que nous avons de l'étenduë suffit pour nous faire connoître toutes les proprietez, dont l'étenduë est capable; & que nous ne pouvons desirer d'avoir une idée plus distincte & plus féconde de l'étenduë, des figures & des mouvemens que celle que Dieu nous en donne.'

God), provided we follow the correct method. So, whereas Malebranche uses the distinction between sensations and ideas to make a radically rationalistic and anti-empiricist point, Crousaz employs the same distinction in an empiricist context.

The structure and content of Crousaz's taxonomy of ideas, his discussion of simple and complex ideas, of concrete, abstract and universal ideas roughly follows the pattern established by Arnauld's *Logique.* Crousaz stresses the importance of clear and distinct ideas. We should not commit anything to our memory that is not clear and distinct.[45] In *De logicæ cum physica ... nexu* he points out that logic helps us to overcome the diseases of the mind; thanks to logic 'clear and distinct ideas will return spontaneously'.[46] He does not, however, equate clarity with distinctness and in this respect he does not follow the *Logique.* A clear idea is 'an idea by which we are vividly affected or an idea that is present to an attentive mind'.[47] In a certain sense, all ideas are clear. Since every idea is by definition an act that is conscious of itself, and since this very consciousness meets the criterion of liveliness, it follows that there is no idea that is not at the same time also a clear idea.[48] Crousaz makes a similar point regarding distinctness (of which he does not give a proper definition). Similar to Locke (see above, §2.4), he maintains that we can see at once that any given idea is different from all other ideas, so that, strictly speaking, there are no ideas that are not distinct, i.e. there are no confused ideas. While Locke, however, subsequently focussed on the relation between ideas and words, in order to show that confusion is, nevertheless, a very real threat, Crousaz confines the problems caused by a lack of distinctness to the relation between ideas. The difference between idea (x) and all other ideas can sometimes be less easily perceived than the difference between idea (y) and all other ideas. This occurs, firstly, when idea (y), because of its liveliness, catches our attention more easily than idea (x) or, secondly, when (y) includes more diversities that disagree more (with all other ideas) than (x).[49] The first point fails to carry much conviction; the use of

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[45] Crousaz, *Compendium,* I. i. 9, p. 48: 'nihil memoriæ mandandum est, quod non priùs clarè & distinctè, quantum fieri potest, conceperis'.

[46] Crousaz, *De logicæ cum physica ... nexu,* p. 8: 'Redibunt spontè sua ideæ claræ atque, distinctæ'.

[47] Crousaz, *Compendium,* I. iii. 1, p. 102: 'idea quâ vividè afficimur vel, quæ menti attendenti præsens est'.

[48] *Ibid.* I. iii. 1, p. 102: 'omnes ideas claras esse, ea ipso quo sunt ideæ'.

[49] *Ibid.* I. iii. 1, p. 103: 'quia *vivaciores* attentionem magis sibi conciliant, vel, quia *plures diversitates* includunt. & magis discrepantes.'

the criterion of liveliness seems to reduce distinctness to clarity. The problem with the second point is that Crousaz does not explain what exactly it means for an idea to have more or less diversities than other ideas.

Crousaz's discussion of concrete, abstract and universal ideas is again an example of the moderate anti-Aristotelianism in the *Compendium.* He does not reject the use of universals or predicables forthwith, rather, he contends that the use of genera and species can be useful in teaching and may help the memory of students. Furthermore, he makes a careful distinction between on the one hand 'contingent things, facts and physics', where we proceed from the examination of singular things to more universal propositions, and the necessary things of science on the other hand. The elements of the first category should be investigated one by one with the help of our senses, but in the second category universals can be 'used fruitfully'.[50] This is a far cry from the parallel place of *A New Treatise,* where Crousaz had concluded his discussion of universals with the following venomous remark: 'This is what the Schoolmen offered as the Key of the Sciences: it was the magnificent Introduction into the great Art of Reasoning. One can hardly conceive, at least one must see it to believe it, how fond they were of those Fooleries.'[51]

When taken together, the three sections of part I of Crousaz's *Compendium* reveal a complicated pattern that shows influences by Aristotle, Descartes, Malebranche and Locke.

6.6. *Propositions: Mental and Verbal*

Although Arnauld defined judgements in terms of ideas, yet words, rather than ideas, figure most prominently in his discussion of propositions and syllogisms (see above, §3.1). By contrast, Locke's explicit distinction between mental and verbal propositions (§2.4), and his preference for the former over the latter, allow him to continue his logic of ideas from the first stage into the second stage, comprising both propositions and reasoning. The Lockean distinction between verbal and mental propositions is implicitly present in Crousaz as well. When the human mind is making judgements, it

[50] *Ibid.* I. iii. 3, p. 115: 'In rebus vero necessariis ... cum fructu adhiberi solet. Res contingentes quæ hoc vel illo modô esse possint, quales sint scire si cupiamus, singulatim contemplandæ sunt & sensibus usurpandæ'.

[51] Crousaz, *A New Treatise,* vol. II, p. 91.

first contemplates two (or more) ideas, then perceives the relation between these ideas and finally compares them and acknowledges them as conjoint or separate.[52] For mental propositions Crousaz uses the term 'judgement', while for verbal propositions he reserves the term 'proposition' *tout court.* (Although the distinction between mental and verbal propositions is Lockean, Crousaz uses the term 'judgement' in a way that is different from the Englishman, who had used the term for probable, as opposed to certain, knowledge.[53]) Crousaz then continues with the remark that propositions consist of a subject (or *suppositum*) and an attribute (predicate) that are connected by a copula.[54] This definition of a proposition firmly sets the stage for a traditional Aristotelian discussion of verbal propositions. Indeed, much of the subsequent discussion of propositions in part II is as traditional as Arnauld's treatment of the same subject. This holds true for Crousaz's treatment of universal and particular, affirmative and negative propositions; for congregative and segregative complex propositions; and for material and formal propositions.

Remarkably enough, however, Crousaz does not, like Arnauld, shelve the subject of ideas once he has embarked on his conventional discussion of (verbal) propositions. His opening statement about ideas as the basis for judgements, even when these judgements are expressed in words, is not left to itself as an isolated remark. Ideas continue to appear in the entire part on judgements. However, Crousaz's ideas, unlike Lockean ideas, are adjusted to the content of Aristotelian logic. In Locke's logic the relation between the ideas that are involved in an affirmation or negation is symmetric. Knowledge is based on the perception of the agreement or disagreement of ideas. When ideas are joined by affirmation or separated by negation, there is no verdict about which idea contains, or does not contain, the other idea.[55] By contrast, in Aristotelian logic, the relation between subject and predicate is always asymmetric, in the

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[52] Crousaz, *Compendium*, II. i, p. 127: '*Primò* rerum duarum pluriumve Ideas contemplatur. *Secundo* harum relationibus, ac inter se habitudinibus attentit. *Tertio* Ideas hoc modo collatas conjungit vel separat, seu conjunctas agnoscit vel separatas fatetur.'

[53] Locke, *Essay*, IV. xvii. 17, p. 685.

[54] Although this distinction is perfectly conventional, Crousaz couches the definition of 'copula' in terms of the logic of ideas, see Crousaz, *Compendium*, II. i, p. 128: 'Actus mentis, notiones illas conjunctas aut separatas, agnoscentis, *Copulæ* nomine venit'.

[55] Note that the absence of one idea containing another idea in Locke is limited to the specific context of ideas that are compared in mental propositions. In other contexts Locke is not averse from using this terminology; one or more simple ideas can be contained by a complex idea.

sense that subjects contain predicates, while no predicate contains a subject. Between Aristotelian *terms* (subjects and predicates) there is a hierarchy that is lacking between Lockean *ideas*. Remarkably enough, the exigencies of Aristotelian logic seem to have prompted Crousaz to drop the symmetric character of ideas. According to him, in judgements, i.e. mental propositions, one idea contains another idea in the same way as a subject contains a predicate in verbal propositions.[56] He does not appear to have fully appreciated the problems and even absurdities ensuing from an identification of terms and ideas, but, given the context of the rest of the *Compendium*, the result can be considered as an attempt at reconciliation between an Aristotelian logic based on (asymmetric) terms and a new logic based on (symmetric) ideas.

6.7. *Syllogisms*

In Crousaz's discussion of syllogisms the difference between Lockean symmetry and Aristotelian asymmetry continues to be relevant. When Locke mentions the quest for intermediate ideas as the essence of the mental activity of reasoning, he again maintains that there is a symmetric relation between the ideas that form the chain by which two ideas are connected. Ideas should be *connected*, but this does not imply that that one idea *contains* another idea. This absence of a hierarchical subject-predicate relation is illustrated by Locke's own example for reasoning by means of intermediate ideas:

> *v.g. Men shall be punished, — God the punisher, — just Punishment, — the Punished guilty — could have done otherwise — Freedom — self-determination* ... here the Mind seeing the connexion there is between the *Idea of Men's Punishment in the other World*, and the *Idea of God punishing*, between *God punishing*, and the *Justice of the Punishment*; between *Justice of Punishment* and *Guilt*, between *Guilt* and a *Power to do otherwise*, between a *Power to do otherwise* and *Freedom*, and between *Freedom* and *self-determination*, sees the connexion between *Men*, and *self-detemination*.[57]

[56] Crousaz, *Compendium*, II. iv, pp. 138–139: 'Cùm affirmare, sit declarare quænam intra Ideam aliquam contineantur, paret Ideam affirmatam nulla complecti attributa, quæ non contineantur intra eam de quâ sit affirmatio, adeòque *Prædicatum* affirmari de *Subjecto*, secundum omnem suam comprehensionem: non tamen necesse est ut Idea affirmata nullibi contineatur, præter quam in Ideâ de quâ sit affirmatio, nam attributa omnia prædicati intra Ideam non solum subjecti, sed etiam aliarum rerum contineri possunt, adeoque prædicatum affirmari potest de pluribus subjectis'.

[57] Locke, *Essay*, IV. xvii. 4, p. 673.

Crousaz follows Locke in admitting that reasoning involves looking for intermediate ideas, but stresses that the basic format consists of looking for a third idea between two given ideas. He uses this point in order to identify, like Arnauld (see above, §3.1), a third or intermediate idea with a middle term. At the same time he reverts from Lockean symmetry to Aristotelian asymmetry: 'When two ideas are put forth, some third idea has to be thought and supposed that is contained by the first idea and that itself contains the second idea, from which it is evident that the second idea is contained by the first'.[58] Speaking about a third idea that is contained by the first idea and that itself contains the second idea is in accordance with syllogistic logic, where the middle term contains the predicate but is itself contained by the subject. So Crousaz's attempt at compromise between old and new logic is carried through from the level of propositions into the level of syllogisms. Contrary to Arnauld, Crousaz maintains the terminology of ideas throughout his discussion of syllogisms. He continues to use third (intermediate) ideas as synonyms for middle terms in his three laws of reasoning:

> First, the thesis under investigation should be carefully examined. Second, a third idea should be thought that has two properties: it should be contained by the subject and it should contain [itself] the predicate of the thesis that is set forth. Finally, this third idea should be skilfully connected with the subject and the predicate.[59]

6.8. *Two Methods*

In the fourth and last part of the *Compendium* Crousaz treats the subject of method. We have already seen (§6.3) that he gives a method for empirical research in the first section of the first part. His discussion of method in part four is not so much geared to the generation of new knowledge as to the ordering and learning of existing knowledge.[60] He devotes a separate chapter to the method of teaching

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[58] Crousaz, *Compendium*, III. 1, p. 155: 'Duabus ideis propositis, est investiganda & assumenda *tertia* quædam *Idea* quæ intra primam contineatur, ipsaque secundam contineat, unde patebit hanc secundam intra primam contineri'.

[59] *Ibid.* III. 2, pp. 155–156: '*Primò*, quæstio ipsa diligenter excutienda. *Secundò*, investiganda tertia idea, cujus duæ sint proprietates, contineri intra subjectum, & continere attributum quæstionis propositæ; Est *denique* tertia illa idea peritè applicanda subjecto & attributo.'

[60] *Ibid.* I. i. 1, p. 6.

and points out that the best method of teaching follows the order in which things have been invented.[61] His succinct discussion of the analytical and synthetical method is given within this explicitly didactic context.

The most interesting aspect of part IV of the *Compendium* is that Crousaz, like Descartes and Locke (see above, §§2.1 and 2.5), gives two methods—but the contents of his methods and his aims are quite different from either of his illustrious predecessors. The new logicians had stressed the importance of starting with a scrutiny of our own individual faculties and of a subsequent trust in the capacity of our own understanding, free from the weight of scholastic tradition, against the supposedly uncritical faith in authority of Aristotelian logicians. Crousaz tries to make the best of both worlds. He makes a distinction between methods that should be followed when we listen to other people or read their works, and methods that should be followed when we depend on our own reflections. In this way he tries to salvage both scholastic erudition and individual (Cartesian) meditation. To each method he devotes a separate chapter.[62]

On the first method he observes that although there is only one truth, the ways of error in our meditations are manifold, and these errors can be corrected by listening to the opinion of others or by reading books. We often tend to neglect this plausible procedure because we are deceived by self love, certain stubborn habits, and by hatred of our enemies.[63] Since books are an important source of knowledge, Crousaz takes the trouble of explaining by what method we can profit most from books. His not very remarkable advice is that we should take care to note what exactly the author is writing about, what points he is making and by what arguments these points are defended.[64]

On the second method he remarks that those who inquire into truth with their own meditation, should take care to follow four rules, of which the first two again illustrate his desire for compromise. According to the first rule, we should dissolve complicated matters into their constituent parts. The second rules states that we should compare subject and attribute and see whether anything is

[61] *Ibid.* IV. 5, p. 199: 'R. Quæ inventa eô tradit ordine quô inventa fuerint.'
[62] *Ibid.* IV. 4 and IV. 2 respectively.
[63] *Ibid.* IV. 1, p. 191.
[64] *Ibid.* IV. 4, p. 198.

lacking that might elucidate their mutual relation.[65] The first rule recalls (again, see above §6.3) Descartes's third rule given in the *Discours*, while the second is couched in an Aristotelian vocabulary.

6.9. *Conclusion*

Crousaz's *Compendium* is a logic of ideas that contains an empiricist epistemology and methodology. Yet this work owes as much to Arnauld and Malebranche as it owes to Locke. The structure of the *Compendium* is unique amongst representatives of the new logic in that Crousaz gives both a Malebranchean structure of which the key-elements are the human faculties, and a Lockean structure that is centred around ideas. Crousaz is a special case in other regards as well. We have seen that Arnauld and Le Clerc made use of an old Aristotelian structure in which they seem to have lost faith. This obsolete structure was used to discuss the contents of the new logic of ideas in much the same way as the late Beethoven would continue to use the conventional sonata form for the expression of his newest musical ideas. In the case of Crousaz, on the other hand, there is no question of a traditional form that is hollowed out from within by novel contents. He is seriously concerned (more so in the *Compendium* than in the original *Logique*) to accommodate the new logic of ideas to Aristotelian logic. The best examples of this strategy are his—not very convincing—attempts at identification of (symmetrical) ideas with (asymmetrical) terms and his defence of both a Cartesian method of individual meditation and a method that is in line with Aristotelian views on learning as a collective endeavour.

[65] *Ibid.* IV. 2, p. 193: '*Primo*, Quæstionem in partes resolvat. *Secundo*, Subjectum cum attributo comparando, à se quærat quænam ea forent quæ cognita relationem utriusque elucidarent.'

CHAPTER SEVEN

NICOLAUS ENGELHARD'S WOLFFIANISM (1732)

7.1. *Introduction*

Nicolaus Engelhard was born in 1696 in Bern. He studied philosophy and mathematics in Lausanne between 1718 and 1721, and theology at the university of Utrecht from 1721 until 1723, when he was appointed professor of philosophy and mathematics at the university of Duisburg. In 1728 he was given the chair of philosophy at the university of Groningen, where he would remain until his death in 1765. He filled the vacancy left by his fellow countryman Crousaz. Initially, Engelhard's loadstar had been Descartes, 'whose most vigorous and rigid follower I used to be'.[1] Yet even when still in Duisburg he turned to the Leibnizian-Wolffian school, and he would become its first representative in the Netherlands. While most Dutch universities in the first half of the eighteenth century had opened their doors to an eclecticism in which Newtonian physics, Cartesian metaphysics and vestiges of Aristotelian philosophy were combined, Engelhard was instrumental in putting philosophy on a Leibniz-Wolffian footing at the university of Groningen, as one of the first universities outside Germany. He produced three short textbooks in which he largely followed Christian Wolff's prolix version of Leibniz's philosophy. However, Engelhard did not follow his German example in every detail and he was not averse from putting forward his own views.

Engelhard's logic, metaphysics and physics were presented in the two-volume *Institutiones philosophiæ theoreticæ tomus prior complectens logicam et metaphysicam, tomus posterior complectens philosophiam naturalem sive physicam* (1732); a second edition, used in the present chapter and referred to as *Logica*, appeared in 1743. Engelhard also produced a textbook on practical philosophy, entitled *Compendium philosophiæ practicæ* (the earliest edition known to me is from 1767).

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[1] Engelhard, *Ruardi Andalæ Dissertatio philosophica*, pp. 25–26: 'cujus eram strenuisissimus & regidissimus sectator', quoted in: Wielema, 'Nicolaus Engelhard', p. 151, n. 4.

The part on logic in the *Institutiones philosophiæ* was published separately as *Institutiones logicæ is usum auditorii domestici adornatæ* (1732, second edition 1742). In addition, Engelhard annotated Leibniz's *Causa Dei*, which is a Latin summary of the *Théodicée* (1710).[2] He also annotated the correspondence between Leibniz and Clarke in a Latin translation by his own hand.[3] In both editions Engelhard took great pains to refute deterministic interpretations of Leibniz that had induced critics (including Crousaz) to charge the German with Spinozism. He also pointed out that the Leibnizian doctrine, according to which we inhabit the best possible world was perfectly compatible with Calvinism and ultimately with the book of Genesis.[4]

Engelhard defended his strand of Leibniz-Wolffianism in several polemics with contemporaries. In Duisburg he had already upheld the cause of monadism against Cartesian attacks by Ruardus Andala.[5] In Groningen he wrote two apologies of the doctrine of preestablished harmony against attacks by his Groningen colleague Antonius Driessen.[6] Finally, in a Dutch tract written under the pseudonym of Daniel Coste van Hessom, he inveighed against what he saw as a tendency towards the haphazard collection of mere facts about nature, and the associated degradation of natural philosophy to natural history, in the work of the Newtonian Petrus van Musschenbroek.[7] Engelhard's polemic views can also be gleaned from his textbooks. In his *Logica*, he quotes Descartes's concept of extension as an example of a fallacious definition,[8] mentions Newtonian attraction as an example of a meaningless concept,[9] and gives the (Lockean) notion of 'thinking matter' as an example of a *contradictio in adjecto*.[10]

Engelhard's Wolffianism did not remain an isolated phenomenon in the Dutch Republic. While Newtonianism became a dominant force at the universities of Leiden, Utrecht and Harderwijk, the curricula in Groningen and Franeker were influenced by Wolff. Engelhard's handbooks at Groningen continued to be used by his

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[2] Leibniz, *Causa Dei asserta per justitiam Ejus*, ed. Engelhard, *Feriæ Groninganæ* 1 (1733) 1–202.

[3] *Viri illustris Godefr. Guil. Leibnitii Epistolarum pentas* (1740).

[4] For general information on Engelhard see Wielema, *Ketters en verlichters*, pp. 103–109 and id. 'Nicolaus Engelhard', *passim*.

[5] Engelhard, *Ruardi Andalæ Dissertatio philosophica*.

[6] Engelhard, *Apologia contra clar. Ant. Driessenii sapietiam hujus mundi* (1734) and id. *Apologiæ contra cl. Ant. Driessenii criminationes* (1734).

[7] Coste van Hessom, *Nodige dog korte aanmerkingen* (1738).

[8] Engelhard, *Logica*, I. I. 4, p. 31.

[9] *Ibid.* I. I. 3, p. 23.

[10] *Ibid.* I. I. 3, p. 23.

faithful German follower Frederik Adam Widder (1724–1784). A Wolffian tradition at Franeker University was inaugurated by Samuel Koenig (1712–1757), a Swiss student of Wolff who tried to reconcile the works of his master with those of Newton. His student Antonius Brugmans (1732–1789), who became professor of mathematics and physics at Groningen in 1766, had similar placatory aims. He used the part on natural philosophy in the second volume of Engelhard's *Institutiones philosophiæ* along with the works on experimental physics by Van Musschenbroek and his predecessor 's Gravesande.[11]

The influence of Wolff went beyond academic philosophy as represented by Engelhard. The whole series of Wolff's seventeen German handbooks was translated into Dutch between 1738 and 1745 by two Germans who lived in Amsterdam, Joan Christoffel van Sprögel and Adolph Fridrik Marci.[12] These volumes may very well have satisfied the needs of developed Dutch readers who were not able to read either Latin or German and who did not harbour any specific Wolffian predilections but were rather looking for a commodity that was rare in the late 1730s and the early 1740s: a comprehensive Dutch survey of modern philosophy.[13]

7.2. *Structure*

Engelhard's logic starts with a preliminary chapter that contains a definition and division of logic, followed by a theoretical part that contains the following three sections:

I. 1. On the first operation of the mind.
2. On ideas or notions.
3. On the use of terms or words.
4. On definitions.
5. On truth and falsity in the first operation of the mind.

II. 1. On the second operation of the mind.
2. On propositions
3. On truth and falsity in the second operation of the mind.
4. On theoretical and practical, demonstrable and non-demonstrable propositions.

[11] Wielema, *Ketters en verlichters*, pp. 109–110.
[12] *Ibid.* p. 116.
[13] *Ibid.* p. 116.

III. 1. On the third operation of the mind.
2. On truth and falsity in the third operation of the mind, i.e. in reasoning.
3. On syllogisms and paralogisms.[14]

The theoretical part is followed by a practical part that is divided into four sections:

I. 1. On human knowledge.
II. 1. On the formation of definitions.
2. On the formation of demonstrations.
3. On the formation of hypotheses.
4. On hearing teachers and reading books.
III. 1. On convincing other persons.
IV. 1. On defending the truth against objections and against the employments of received disputations[15]

Engelhard's logic is clearly structured along the lines of Wolff's *Philosophia rationalis sive logica, methodo scientifica pertractata et ad usum scientiarum atque vitæ apata,* which, after a preliminary section on philosophy in general and a prolegomenal chapter on logic in particular, proceeds with a part on theory and a part on practice. The theoretical part of Wolff's logic is divided into the following four sections:

I. On the principles of logic
II. On notions specifically
III. On judgement specifically
IV. On reasoning or discourse specifically[16]

The practical part consists of the following six sections:

I. On the use of logic in order to distinguish true from false and certain from uncertain.
II. On the use of logic for the investigation of truth.

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[14] Engelhard, *Logica*: 'I.1. De Prima Mentis Operatione', '2. De Ideis sive Notionibus', '3. De Usu Terminorum sive Vocum', '4. De Definitionibus', '5. De Veritate et Falsitate in Prima Mentis Operatione', 'II.1. De Secunda Mentis Operatione', '2. De Propositionibus', '3. De Veritate et falsitate in secunda Mentis operatione', '4. De Propositionibus Theoreticis et Practicis, Demonstrabilibus et Indemonstrabilibus', 'III.1. De Tertia mentis operatione', '2. De Veritate et falsitate in tertia mentis operatione, sive in ratiociniis' and '3. De Syllogismis et Paralogismis'.

[15] *Ibid.* 'I.1. De Cognitione Humana', 'II.1. De Formandis Definitionibus', '2. De Formandis Demonstrationibus', '3. De Formandis Hypothesibus', '4. De Audiendis Docentibus et Legendis Libris', 'III.1. De Convincendis aliis' and 'IV.1. De Veritate contra objectiones vindicanda, et disputationibus usus receptis.'

[16] Wolff, *Philosophia rationalis*: 'I. De logicæ principiis', 'II. De notionibus in specie', 'III. De judicio in specie' and 'IV. De ratiocinatione seu discursu in specie.'

III. On the use of logic for writing, judging and reading books.
IV. On the use of logic for communicating truth to other persons.
V. On the use of logic for estimating the powers that are required for the knowledge of things.
VI. On the use of logic for the practice life and on the method by which it should be studied.[17]

The general division into a theoretical and a practical part seems unlike anything that we have seen so far in either Aristotelian logic or a quadripartite logic consisting of ideas—propositions—syllogisms—method. Rather, they give a first part in which they treat ideas, propositions and syllogisms, which is followed by a second part where they investigate the practical use of their logic. This division is in line with the general importance attached by Wolff to practical applicability and constitutes less of a rupture with the logical tradition than a first impression seems to indicate. In the practical part of the *Philosophia rationalis* Wolff tries to fulfil the expectations that are raised by the latter part of its title; his logic is supposed to be *ad usum scientiarum atque vitæ aptata* ('suitable for use in the sciences and in life'). He tries to achieve this practical aim by giving an answer to the question of how we can best use the faculties of our understanding and this is a methodological question. Moreover, Wolff's use of the term 'notion' accords with the term 'idea' in the Cartesian tradition. The result is a structure that roughly agrees with the conventional quadripartite specimens of logic: the sections on notions (ideas), judgements and reasoning in part I are followed by part II, which has a character that is not only practical, but also methodological.

7.3. *Leibniz-Wolffian Logic*

For a meaningful appreciation of Engelhard's logic it is essential that we first give a brief survey of the logic of the Leibniz-Wolffian school. Gottfried Wilhelm Leibniz was the most original logician of the early modern period. His most creative innovations can be found where logic and mathematics intersect. He developed a system of symbols, or *characteristica universalis*, for the presentation of scientific propositions; a system of rules for the manipulations of these symbols, or *calculus ratiocinator*; and a system of definitions, or *ars combinatoria*,

[17] Wolff, *Philosophia rationalis*: 'I. De usu Logicæ in vero a falso, certoque ab incerto dijudicando', 'II. De usu Logicæ in veritate investiganda', 'III. De usu Logicæ in libris conscribendis, dijudicandis & legendis', 'IV. De usu Logicæ in veritate cum aliis

that governs the introduction of new symbols. His logic forms in many ways a syncretic culmination of the various different logical strands that we have discussed so far. He uses elements that are typical of both Aristotelian logic and of the logic of ideas. Although his logic is in many regards more modern than the most sophisticated specimens of the logic of ideas, he gives a forceful defence of syllogisms, be it in an updated form. In the *Nouveaux essais sur l'entendement humain*, his famous reply to Locke's *Essay*, he praises the syllogism as one of the most beautiful inventions of the human mind that is fully compatible with his project for a universal mathematics; syllogisms are infallible if only one knows how to use them.[18]

Given the structural similarity of Engelhard's *Logica* with Wolff's *Philosophia rationalis*, we are interested more in Wolff than in Leibniz himself. This distinction is not trivial. The conventional picture of Christian Wolff as a faithful and slavish systematizer of Leibniz thoughts, which were left scattered among countless unpublished manuscripts, is incorrect.[19] The term 'Leibniz-Wolffian school' suggests more continuity than is warranted. This point holds true in general and is true for the specific field of logic in particular. Leibniz's contemporaries knew little more about his logic than his doctrine of the Principle of Contradiction and the Principle of Sufficient Reason as set forth in the *Théodicée* and in the 'Meditationes de cognitione, veritate et ideis'. Leibniz's thoughts on an exact and calculable language of reasoning remained unpublished (with the exception of some letters), and thus received no attention. In so far as Wolff gave attention to these subjects at all, it was not in his logic.[20] Moreover, Wolff's earlier views on logic showed distinct instances of Cartesian influence that are absent in Leibniz himself. Accordingly, in the earlier 'German Logic' (the *Vernünftige Gedanken von den Kräften des menschlichen Verstandes*, 1713) Wolff is more critical about Aristotelian syllogisms than in the later 'Latin Logic' (the *Philosophia rationalis sive logica*, 1728).

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communicanda', 'V. De usu Logicæ in æstimandis viribus ad rerum cognitionem requisitis' and 'VI. De usu Logicæ in praxi vitæ & methodo eam studendi.'

[18] Leibniz, *Nouveaux essais*, p. 378: 'Je tiens que l'invention de la forme des syllogismes est une des plus belles de de l'esprit humain, et mêmes des plus considérables. C'est une espèce de *mathématique universelle* dont l'importance n'est pas assez connue; et l'on peut dire qu'un art *d'infaillibilité* y est contenu, pourvu qu'on sache et qu'on puisse s'en bien servir, ce qui n'est pas toujours permis.'

[19] See Corr, 'Christian Wolff and Leibniz', pp. 241–262.

[20] Risse, *Logik*, II, p. 249.

The main characteristics of Wolff's logic can be summarized in six points, which are taken largely from the *Philosophia rationalis*.[21] Firstly, there is the central importance of Leibniz's Principle of Contradiction, according to which something cannot both exist and not exist, and the Principle of Sufficient Reason, according to which nothing can exist for which there is not a sufficient reason or cause. Philosophy is determined by the Principle of Contradiction as to what is possible and determined by the Principle of Sufficient Reason as to what is real. Both principles, as formulated in the *Théodicée* and in the 'Meditationes de cognitione, veritate et ideis', have a predominantly ontological context, but they pertain to logic as well. For instance, they are at the root of the distinction (also made by Crousaz, see above, §6.3) between natural logic and artificial logic. While *logica naturalis* is merely based on the Principle of Contradiction, i.e. on what is factually possible but can still be confused, *logica artificialis* is based on the Principle of Suffient Reason, i.e. on what is necessary and thus distinct.[22]

Wolff's use of two principles that have a predominantly ontological context, as a criterion for the distinction between natural logic and artificial logic, points to a constantly recurring theme in his work: that of the complicated dialectical relation between logic and ontology. His interest in this relation becomes especially obvious in his treatment of notions. In so far as logic pertains to the activity of understanding, i.e. having *notions* of things, and ontology pertains to the *things* we have notions of, notions are central to both logic and ontology. This dual role of notions accords with Wolff's formal and material distinction between notions. A *formal* distinction between notions takes into account the properties of the notion itself. A *material* distinction between notions is based primarily on the properties of the things behind these notions rather than on the notions themselves. In formal distinctions between notions the accent is logical, whereas in material distinctions the accent is ontological. The complicated relation between logic and ontology explains much of the paradoxical position of logic within the larger Wolffian system of knowledge. On the one hand, logic precedes all other disciplines, including ontology, in so far as it determines their rules of thought. On the other hand, logic can never begin without acknowledging

[21] Compare my six-point survey of Wolff's logic with the seven-point characterization in Risse, *Logik*, II, pp. 615–616.

[22] Natural logic: Wolff, *Philosophia rationalis*, 'Logicæ prolegomena', vol. II, p. 108ff.; artificial logic: *ibid.* vol. II, p. 113ff.

the predominantly ontological Principles of Contradiction and of Sufficient Reason. In addition, logic is not only dependent on ontology, but also on psychology; logic cannot proceed without a prior knowledge of our understanding.Thus, in one regard logic precedes ontology and psychology and in another regard it is preceded by these disciplines.[23]

Secondly, Wolff adheres to the logic of ideas to the extent that he stresses the importance of the clarity and distinctness of notions. These qualities are discussed within the framework of the formal distinctions between ideas. Within these formal distinctions Wolff presents the clarity, distinctness, completeness and adequacy of notions in a hierarchical relation. A notion is clear when it *shows* us the marks by which we can know the thing in question and by which we can discern it from other things.[24] A clear notion is distinct, when we can *distinguish* the marks by which we know the thing in question.[25] A distinct notion is complete, when its marks allow us to distinguish it from other notions.[26] A complete notion is adequate, when all its constituent notions are themselves distinct.[27] Wolff's taxonomy is not original and can also be found in Leibniz's 'Meditationes de cognitione, veritate et ideis'.[28] Besides, we have already encountered the hierarchical relation between clear and distinct in Descartes (§2.4).

Thirdly, the importance of psychology in Wolff's logic is in line with the subjectivist and psychological orientation of the logic of ideas. In his *Vernünftige Gedanken*, logic is given the express task of providing us with knowledge about the forces of the human understanding and their use in the perception of truth.[29] Wolff follows most

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[23] Wolff, *Philosophia rationalis*, 'Discursus Præliminaris', §88, vol. I, p. 39: '*Si philosophiæ cum fructu operam navare decreveris, Logica primo omnium loco pertractanda* ... Sane qui nulla Logicæ notitia instructus est, ignorat, qua ratione definitiones & demonstrationes sint examinandæ'; and *ibid.* §90, vol. I, p. 40: 'Ontologia igitur & Psychologia Logicam præcedere debent, si in ea singula rigorose demonstranda, rationibus regularum genuinis allatis.'

[24] *Ibid.* I. ii. 1, vol. 2, p. 156: '*Notio clara* est, quæ nobis notas exhibet ad rem agnoscendam atque ab aliis discernendam sufficientes'.

[25] *Ibid.* I. ii. 1, vol. 2, p. 158: '*Notio clara*, quam habemus, *distincta* est, si notas, quas nobis sistit, distinguere valemus'.

[26] *Ibid.* I. ii. 1, vol. 2, p. 160: '*Notio completa* est, quæ notas sufficientes exhibet ad rem in statu quolibet agnoscendam & ab aliis distinguendam'.

[27] *Ibid.* I. ii. 1, vol. 2, p. 161: 'Notio distincta in notiones distinctas notarum, quæ eam ingrediuntur, a cognoscente resolubilis dicitur *adæquata*'.

[28] Leibniz, 'Meditationes de cognitione, veritate et ideis', transl. as 'Betrachtungen über die Erkenntnis', pp. 9–11.

[29] Wolff, *Vernünftige Gedanken*, pp. 117–118: 'wie weit sich dieses Vermögen [der Verstand] erstrecke, und wie man sich desselben bedienen müsse, so wohl durch

of his predecessors discussed so far in structuring his logic around the operations of the mind. Given this conception of logic it is not surprising that in the *Psychologia empirica* (1732) Wolff explicitly claims that the principles of logic are taught by psychology.[30] Later, in the *Philosophia rationalis*, logic is defined as 'That part of philosophy that teaches the use of the cognitive faculty for learning the truth and for avoiding error.'[31] The three most important cognitive faculties are those of simple apprehension (of notions), of judging and of reasoning.[32]

Fourthly, there is the importance of mathematics for Wolff's logic, although not in the same sense as this discipline had been important for Leibniz. Leibniz's project for the development of logical symbols and rules for the manipulation of these symbols can be seen as an attempt to reduce logic to a calculable activity. At the same time Leibniz's views on notions, judgements and syllogisms were so fundamental that they provided a general logical basis on which mathematics was founded as well. This vast project remained without further development in the eighteenth century. Admittedly Wolff, and other followers of Leibniz, assigned a substantial role to mathematics. This was especially the case in Wolff's earlier *Vernünftige Gedanken*, where mathematics is presented as an eminent instrument in helping to make a correct use of the understanding.[33] Wolff does not forget to mention Locke's 'Conduct' as a work where the same point is made about the use of mathematics as a means of sharpening the understanding.[34] Nevertheless, this instrumental importance

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eigenes Nachsinnen die uns verborgene Wahrheit zu erkennen, als die von andern an das Licht gestellete vernünftig zu beurtheilen, fället nicht gleich einem jeden in die Augen. Derowegen damit wir wissen, ob wir zu der Weltweisheit geschickt sind, oder nicht; soll dieses unsere erste Arbeit seyn, daß wir die Kräfte des menschlichen Verstandes und ihren rechten Gebrauch in in Erkäntniß der Wahrheit erkennen lernen.'

[30] Wolff, *Psychologia empirica*, 'Prolegomena', p. 7: '*Psychologia empirica principia tradit logicæ* ... Nimirum si rationem a priori reddere velis regularum logicarum, ad ea recurrendum, quæ de facultate cognoscendi in Psychologia traduntur.'

[31] Wolff, *Philosophia rationalis*, 'Discursus Præliminaris', I, vol. I, p. 30: 'Ea philosophiæ pars, quæ usum facultatis cognoscitivæ in cognoscenda veritate ac vitando errore tradit.'

[32] *Ibid.* I. i. 1, vol. II, p. 136: 'Tres sunt mentis operationes, quibus ea circa cognoscibile versatur, notio com simplici apprehensione, judicium & discursus.'

[33] Wolff, *Vernünftige Gedanken*, p. 107: 'einem Mittel, zu rechtem Gebrauche des Verstandes zu gelangen'.

[34] *Ibid.* p. 107; cf. Locke, 'Conduct', par. 21 (§7): 'I have mentioned mathematicks as a way to setle in the minde an habit of reasoning closely and in train· not that I thinke it necessary that all men should be deep mathematicians, but that haveing

of mathematics (see also above, §2.2) does not lead to a change of logic from within, as had been envisaged by Leibniz. The role of mathematics in Wolff's logic is largely limited to the way in which he presents his material and to his choice of examples. Wolff's logic is not mathematical because of its calculability but rather because it is presented *more geometrico*, and abounds with definitions, axioms and postulates.

Fifthly, there is the central role of both definitions and syllogisms in Wolff's logic. Whereas Cartesian philosophers had presented their enthusiasm for mathematics in a context that tended to be aggressively anti-Aristotelian in general and anti-syllogistical in particular, Leibniz, and also Wolff, saw no conflict between syllogisms and a presentation *more geometrico*. Wolff follows Leibniz in denying the well-known accusation that syllogisms are not able to furnish us with new knowledge. In the *Vernünftige Gedanken* he even stresses that by syllogisms 'everything is discovered that is produced by the human understanding'.[35] He also came round to the Leibnizian view that no mathematical proof can supplant the figure of the syllogism. Logic can be fruitfully presented in a geometrical way, but ultimately mathematics is reducible to logic, not the other way round. Thus Wolff writes, again in the *Vernünftige Gedanken*, that geometrical demonstrations are in fact syllogisms, that all new mathematical knowledge is discovered syllogistically, that we should use syllogisms when we try to give a mathematical demonstration in other disciplines, and that we can withstand even the most subtle errors with the help of syllogisms.[36]

Related to syllogisms, is the importance of definitions. In the *Philosophia rationalis* Wolff points out that nominal definitions function as the first principles of reasoning, from which things can be deduced.[37] Definitions are the basic elements of a rationalistic system that, according to Wolff, should enable us to reach verdicts on

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got the way of reasoning which that study necessarily brings the minde to they might be able to transfer it to other parts of knowledg as they shall have occasion.'

[35] Wolff, *Vernünftige Gedanken*, p. 171: 'Durch diese Schlüsse wird alles erfunden, was durch menschlichen Verstand heraus gebracht wird'.

[36] *Ibid.* p. 173: '1. daß man in den geometrischen Demonstrationen sich würcklich in richtige Forme gefassete Schlüsse dencket; 2. daß nichts in der Mathematick selbst als durch dergleichen Schlüsse gefunden werde; 3. daß, wenn man in andern Disciplinen nach mathematischer Art etwas demonstriren und vortragen will, die in richtiger Forme verfasseten Schlüsse uns dazu bringen müssen; 4. daß man durch Hülfe dieser Schlüsse den subtilesten Irrthümern widerstehen kan'.

[37] Wolff, *Philosiophia rationalis*, I. ii. 4, vol. II, p. 215: 'Præbent quoque prima ratiocinandi principia, ut quæ de rebus cognosci possunt inde deducantur.'

truth by purely logical means. The view that the various truths of various disciplines could be elevated to the rank of a rational *scientia generalis* by definitions, had prompted Leibniz to the grandiose but abortive project of starting an encyclopaedic survey of definitions of the various disciplines. The most interesting point about definitions is that they are expressed in *words*. Given the pivotal function of definitions, and thus of words, the question arises to what degree Wolff's logic can still be regarded exclusively a logic of *ideas*. Admittedly, he does acknowledge the importance of ideas (notions) for his logic. In the *Vernünftige Gedanken*, however, he explicitly puts syllogisms on the same high par as notions: 'The first chapter on notions and the fourth on syllogisms are the most important, for when you desire thourough knowledge, then clear notions and orderly demonstrations are of the highest importance.'[38] Whereas Descartes's and Locke's concept of an informal logic (based on a subjective intuition of the relation between *ideas* that is supposed to sharpen the faculties of the mind) was directed against the dominant position of syllogisms, Wolff combines a psychological orientation, in which he has due regard for faculties and notions, with a formal logic that consists of mathematically certain syllogisms that are first of all based on definitions, i.e. *words*, even though these definitions are supposed to express complete notions.[39]

Sixthly, Wolff's logic contains both a methodology and an epistemology. The former is as narrow in scope as the latter is broad in content. In part II of the *Philosophia rationalis* Wolff discusses the ways by which we can form definitions *a posteriori*, which are based on sensory perception, in addition to *a priori* definitions.[40] Although he does not forget to recommend the use of microscope and telescope in his treatment of definitions *a posteriori*,[41] his primary aim is not the formulation of a general methodology for the natural sciences.[42] He

[38] Wolff, *Vernünftige Gedanken* (preface to the second edition), p. 110: 'Das erste Capitel von den Begriffen, und das vierdte von den Schlüssen sind die beyden wichstigsten. Denn wo man gründliche Erkäntniß liebet, kommet es hauptsächlich auf deutliche Begriffe und ordentliche Beweise an.'

[39] Wolff, *Philosophia rationalis*, I. ii. 4, vol. II, p. 189: '*Definitio* est oratio, qua significatur notio completa atque determinata termino cuidam respondens.'

[40] *Ibid.* II. ii. 1, vol. II, p. 481: '*Utimur* autem *in veritate* proprio Marte *eruenda vel solo sensu*, vel *ex aliis cognitis ratiocinando elicimus nondum cognita*. In priori casu dicimur *veritatem eruere a posteriori*; in posteriori autem *a priori*.'

[41] *Ibid.* II. ii. 2, vol. II, pp. 496–497.

[42] *Ibid.* II. ii. 1, vol. II, p. 480: 'Non nobis jam propositum est artem inveniendi exponere, cujus est tradere regulas, juxta quas operationes mentis diriguntur in veritate investiganda, propterea quod regulæ Logicæ sole ne quidem ad artem inveniendi

rather focuses on the more narrow question of how our faculties can procure our mind with the material that is needed for subsequent logical processing. He is interested in the question of how sensory perceptions should be handled in order to produce the good definitions on which his logic rests.[43] This point concerning definitions *a posteriori* also throws light on another characteristic of Wolff's logic: its catholic epistemology, i.e. a rationalism that does not imply a Cartesian distrust of the senses. Wolff's treatment of experience is largely positive; he refers to microscopes and telescopes because he wants to discuss *how* we can achieve scientific knowledge that is based on the senses, and this confirms that he does not seriously doubt the *possibility* of true knowledge that is based on the senses. Although he admits that experiences are always limited to single instances, in the *Vernünftige Gedanken* Wolff is confident that we can easily change these instances into general laws, if only we have taken note meticulously of all conditions under which something has happened.[44] Wolff's work is not rationalistic in the sense that it makes outspoken claims about the possibility of obtaining by reason alone a knowledge of the nature of what exists, but rather in the sense that it provides a deductive system in which basic definitions form the ingredients for more complicated propositions (see the definition of rationalism given above, § 2.5).

7.4. *Engelhard's Wolffianism*

The six main elements of Wolff's logic are all well represented in Engelhard's *Logica*. Firstly, Engelhard repeats Wolff when he points out that logic receives its principles from ontology, 'In so far as [logic], from the notion of Being in general, shows that the rules which it prescribes for the direction of the mind in acquiring knowledge of truth, are in conformity with the nature of the things that are learnt.'[45]

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generalem, nedum specialem sufficiunt, sed aliæ bene multæ aliunde derivandæ ad eam præterea requiruntur, de quibus suo loco dicemus.'

[43] *Ibid.* II. ii. 2, vol. II, pp. 492–493: 'Quodsi notæ hoc modo detectæ fuerint sufficientes ad rem perceptam ab aliis distinguendam, notio sic formata erit definitio. Unde patet, *quomodo definitiones a posteriori detegantur.*'

[44] Wolff, *Vernünftige Gedanken*, p. 189: 'wenn wir nur alle Umstände, unter welchen etwas geschehen ist, genau bemercket'.

[45] Engelhard, *Logica*, 'Caput procemiale', pp. 4–5: 'Dum ex notione Entium in genere ostendit, regulas, quas præscribit ad directionem intellectus in cognitione veri, naturæ rerum cognoscendarum conformes esse.'

Ontology revolves around the two Leibniz-Wolffian principles. Engelhard considers the Principle of Contradiction as the criterion of truth in our reasoning.[46] He also follows Wolff when he makes the distinction between natural logic and artificial logic. Moreover, Engelhard continues with a distinction within natural logic between *logica naturalis connata* (which is a mere natural *disposition* to exercise our mind) and *logica naturalis acquisita* (which is an intellectual habit formed as a *result* of this exercise) which also recalls Wolff.[47] The same holds true for his defence of artificial logic, which provides us with distinct knowledge of the rules of logic that are present only in a confused way in natural logic.[48] The dual role of notions in Wolff (logical and ontological), as reflected in the formal and material distinction between notions, recurs in Engelhard as well. In the *Logica* he points out that formal distinctions pertain to the differences between ideas, i.e. the different ways by which we know objects, while material distinctions concern the differences between the objects themselves.[49]

Secondly, Engelhard repeats Wolff's taxonomy of clear, distinct, complete and adequate notions within the category of formal notions.[50] From a terminological point of view, however, he is less consistent than Wolff, for he does not only use the term 'notion' but also (and even preferably) the Cartesian term 'idea'. Thus chapter I. i. 2 of the *Logica* is called *De Ideis sive Notionibus.*

Thirdly, like Wolff, Engelhard follows the logic of ideas in according an important position to the human faculties. Logic 'prescribes rules for finding and learning truth that are commensurate with the faculties of the human mind'.[51] Hence the importance of psychology for logic; 'In so far as [logic] demonstrates that its rules are commensurate with the cognitive faculty, it derives the nature of the

[46] *Ibid.* I. iii. 2, p. 65.

[47] *Ibid.* 'Caput procemiale', p. 2: 'Logica Naturalis Connata ... Est dispositio ad exercitium illius facultatis mentis, quæ circa cognitionem veri versatur'; and 'Logica Naturalis Acquisita ... Est habitus in exercitio facultatis cognoscitivæ circa verum cognoscendum ipso usu acquisitus'. Cf. Wolff, *Philosophia rationalis*, 'Logicæ Prolegomena', vol. II, p. 109.

[48] Engelhard, *Logica*, 'Caput procemiale', p. 2; cf. Wolff, *Philosophia rationalis*, 'Logicæ Prolegomena', vol. II, p. 118: 'Qui enim Logica artificiali pollet, is regulas illas distincti cognoscit, juxta quas diriguntur operationes mentis in cognitione veritatis.'

[49] Engelhard, *Logica*, I. i. 2, p. 8.

[50] *Ibid.* I. i. 2, pp. 8–13.

[51] *Ibid.* 'Prolegomena', p. [x]: 'regulas præscribit in inveniendo et cognoscendo vero mentis humanæ facultatibus proportionatas'.

mind and its operations form psychology.'[52] The phrase about the proportionality of rules to the faculties recurs in Engelhard's definition of *logica docens*, which 'teaches rules that are commensurate with the nature of the human mind, and by which all truth must be investigated and distinguished'.[53] Given this commensurability, it is not surprising that the objects of this logic are said to consist of the operations of the mind. These operations consist of the apprehension of simple things, judgement, and reasoning; and this well-known triplet determines the subject-matter of the three sections of the first part of his logic.

Fourthly, Engelhard stresses the importance of mathematics as a paradigm of clear thinking. For instance, he admits that it is difficult to obtain complete, let alone adequate, ideas. He then continues remarking that the study of mathematics can take away many of the prejudices that stand in the way of such ideas, because 'this science has, with respect to its certainty and perspicuity, snatched the palm away before all other human sciences'.[54] However, Engelhard's application of mathematics to logic, like Wolff's, does not go beyond a general admiration for its exactness, expressed in various examples, and the use of axioms, postulates, corollaria and scholia in its presentation.[55]

Fifthly, Engelhard has a positive opinion of syllogisms; 'since the syllogism is the medium of demonstration, and since by demonstration we arrive at knowledge of unknown things, the help of syllogisms allows us to draw out what is unknown.'[56] Engelhard's praise for syllogisms is matched by his positive evaluation of another peripatetic medium, i.e. that of the disputation. Although we have seen him (above, §7.2) referring to 'defending the truth against ... the em-

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[52] *Ibid.* 'Caput procemiale', p. 5: 'Dum ostendit, regulas suas facultati cognoscitivæ esse proportionatas, naturam intellectus ejusque operationum ex Psychologia deducit.'

[53] *Ibid.* 'Caput procemiale', p. 3: '*Logica docens est* illa, quæ regulas tradit, secundum quas omnis veritas investigari et dijudicari debet, naturæ mentis humanæ proportionatas'.

[54] *Ibid.* I. i. 2, p. 14: 'Cum hæc scientia quoad certitudinem suam atque evidentiam omnibus reliquis scientiis humanis palmam hactenus præripuerit, ejus autem evidentiæ fundamentum situm sit in ideis ejusmodi completis in alias distinctas, et notiones tandem primas resolubilibus, exinde, nisi in ipsa meridie coecutire velint, earum usum ad comparandam eruditionem solidam perspicient.'

[55] *Ibid.* I. ii. 4, pp. 57–60.

[56] *Ibid.* II. ii. 3, p. 106: 'cum enim syllogismus sit medium demonstrandi, per demonstrationes autem in rerum incognitarum cognitionem perveniamus, beneficio syllogismorum incognita eruere licet'.

ployments of received disputations' in the title of chapter IV. i of the *Logica*, like Wolff, he bears no grudge against the medium itself. His critical remarks are limited to trespasses by disputants who show a lack of modesty and good manners.[57] Finally, Engelhard follows Wolff in the major role that he assigns to definitions as well. A definition is defined itself in a Wolffian way as 'a complete notion, expressed by words'.[58] Definitions form the basic material from which axioms, corollaries, or other demonstrable propositions are deduced.[59] Whenever we listen to teachers or read books, we should check whether the discourse in question is in accordance with the rules of logic, and this implies first of all that we should verify whether the terms are well defined.[60]

Sixthly, we have already seen that Engelhard divides his logic in a theoretical and a practical part. Although he alleges to follow Aristotle's division in theoretical and practical philosophy, his use of the practical part of his logic for methodological discussions clearly follows Wolff. The practical part of logic 'shows distinctly how human knowledge can be increased by what has been taught in the first [i.e. theoretical] part of logic'.[61] More particularly, in the first section of the practical part of the *Logica*, he announces the methodological content of the next three sections by stating that practical logic should demonstrate 'the possibility of the *execution* of logical precepts in *finding* and *communicating* truth and in *defending* it against objectors'.[62] In the section devoted to the first activity, that of finding truth, Engelhard repeats Wolff's point that complete notions can be formed *a priori* or *a posteriori*. He admits that forming distinct notions *a posteriori* that are based on the senses is difficult, but does not rule out the possibility of empirical knowledge. He then presents several methodological rules whose narrow scope again recall Wolff. Engelhard's empirical rules are not aimed primarily at the development of science in general, but intended rather as a contribution

[57] See e.g. *ibid.* II. iv. 1, p. 123.

[58] *Ibid.* I. i. 4, p. 26: 'Quid est *Definitio?* Est *notio completa verbis expressa.*'

[59] *Ibid.* II. ii. 1, p. 97: 'Memineris ergo ex definitione aliqua deduci posse *vel* axioma, *vel* corollarium, *vel* aliam quamqunque propositionem demonstrabilem.'

[60] *Ibid.* II. ii. 4, p. 112: '*Primo* examinandum est, num termini, quibus utitur docens, *aut* probe ab eo sint definiti, *aut* juri aliunde cogniti supponantur'. See also *ibid.* II. iv. 1, p. 124.

[61] *Ibid.* II. i. 1, p. 79: 'distincte ostendit, quomodo per ea, quæ in prima parte Logices tradita sunt humana cognitio promoveri possit'.

[62] *Ibid.* II. i. 1, p. 84: 'Ostendo possibilitatem executionis præceptorum Logicorum in *veritate invenienda, communicanda*, et contra dissentientes *vindicanda.*'

towards a demonstrative science that is based on clear definitions; consequently, these rules are formulated in a chapter entitled 'On forming definitions' (II. ii. 1). In the next chapter Engelhard shows how these definitions, based on sensory perception, are fundamental to 'posterior demonstrations' that are formed with the help of 'posterior syllogisms', i.e. syllogisms that are based on experience.[63]

7.5. *Differences between Engelhard and Wolff*

Engelhard never completely shrugged of the early influence of Descartes. His work shows Cartesian influences that can also be found in Wolff. Both, for instance, give a syllogistic version of the *cogito ergo sum*.[64] Engelhard in one place even goes so far as to describe his metaphysics as a *systema cartesianum emendatum*.[65] In addition, his logic shows signs of Cartesianism that have no parallel in Wolff's works. For instance, whereas the most plausible order for the metaphysical disciplines according to Wolff was ontology, cosmology, psychology and theology, Engelhard prefers the order ontology, psychology, theology and cosmology. So, Engelhard places psychology and theology before, rather than after cosmology. This arrangement is in accordance with Descartes' epistemology, according to which I first know that I exist (psychology), then that God exists (theology) and finally that the world around me exists (cosmology).[66]

Engelhard's discussion of the criterion of truth in judgements shows similar Cartesian influences. Wolff had tried to guarantee truth by means of a metaphysics that was understood primarily in an ontological sense. Engelhard also commends metaphysics as a way to reach truth, but he interprets metaphysics theologically rather than ontologically. Metaphysical truth is immutable and depends on God. It is 'as certain that the things that are possible through God have never been impossible and equally that the essences of the things are eternal and immutable, as it is certain that a necessary thing, i.e. God, exists'.[67] One can therefore say, 'that the certainty of our properly

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[63] *Ibid.* II. ii. 2, p. 102: 'Denuo beneficio syllogismorum posteriorum tamdiu probet præmissas præcedentium, donec occurrant judicia intuitiva, *sive* experientiæ indubitatæ.'

[64] Wielema, *Ketters en verlichters*, p. 107.

[65] Engelhard, *Institutiones philosophiæ metaphysicæ*, p. 399, quoted in: De Pater, 'Nicolaus Engelhard', p. 146.

[66] Wielema, *Ketters en verlichters*, pp. 106–107.

[67] Engelhard, *Logica*, I. ii. 3, p. 54: 'quam certum enim est, dari Ens necessarium,

construed judgements is as great as the certainty of the existence of God and that, consequently, there is an infallible criterion of truth in our judgements.'[68] More precisely, this criterion consists of 'The distinct knowledge or the distinct notion of the metaphysical truth, whether or not the predicate is incompatible with the subject.'[69] Here we have echoes of what according to Wolff is the criterion of truth in the corresponding chapter in the *Philosophia rationalis*, I. i. 1: 'The criterion of truth consists of the determinability of the predicate by the notion of the subject.'[70] However, in this work the criterion of metaphysical truth is metaphysical in an ontological, not in a theological sense. Consequently, in Wolff's elaborate index to this work, the word 'God' does not receive any entry. Although Engelhard's concept of metaphysical truth in terms of possibility is Wolffian, his use of theology instead of ontology as a guarantee for metaphysical truth first of all evokes Descartes's use of the existence of God as an epistemological guarantee.

Another difference between Engelhard and Wolff concerns method. In the second part of his *Logica*, Engelhard states that we obtain knowledge of truth either by our own meditation or with the help of others. We should take care that our own meditations are in accordance with the rules of logic; we should form distinct and adequate notions and, using definitions that are based on these notions, take great pains to reason correctly.[71] Knowledge that is obtained trough others can be provided by teachers or by books. In Wolff's *Philosophia rationalis* the distinction between an individual and a collective road to truth is implicitly present, in so far as he discusses the use of logic for the investigation of truth in section II of part II on the one hand, where the accent is on individual praxis, and its use in judging (and writing) books in section III of the same part on the other hand. In his *Vernünftige Gedanken*, the distinction is touched upon more explicitly when Wolff explains in chapter 8 how we should scrutinize our own forces and those of others so that we

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id est, Deum existere, tam certum etiam est, res, quæ per Deum possibiles sunt, nunquam fuisse impossibiles, adeoque rerum essentias æternas esse et immutabiles'.

[68] *Ibid.* I. ii. 3, p. 54: 'Tantam esse cer<e>titutinem judiciorem nostrorum rite institutorum, quanta est est certitudo divinæ existentiæ: et proinde dari criterium veri in nostris judiciis infallibile.'

[69] *Ibid.* I. ii. 3, p. 54: 'Ipsa veritatis metaphysicæ distincta cognitio, sive distincta notio, num prædicatum subjecto repugnet nec ne.'

[70] Wolff, *Philosophia rationalis*, II. i. 1, vol. II, p. 397: 'Veritatis criterium est determinabilitas prædicati per notionem subjecti.'

[71] Engelhard, *Logica*, II. ii. 1, p. 85.

can reach a verdict on whether these forces suffice for the investigation of a given truth.[72] However, in Wolff's logic there is no explicit statement that we can reach knowledge either by our own meditation or by the help of others. Moreover, in Wolff there is preciously little on meditation at all, which clearly fits more in the Cartesian than in the Leibnizian tradition. It is possible that Engelhard merely stated explicitly what was already implicit in Wolff, but it is more likely that he was subjected to other influences. A good alternative candidate might be Engelhard's fellow countryman Crousaz, who had been his predecessor in Groningen. We have already seen (§6.8) that Crousaz made exactly the same distinction, and that he also used the word 'meditation'. Where Crousaz had written in his *Compendium* that someone who learns the truth '*either* investigates on his own accord, *or* is assisted by the help of others',[73] Engelhard echoes that we achieve truth '*either* by our own meditation, *or* with the help that is provided by others'.[74]

7.6. *Conclusion*

With Engelhard's Wolffianism we have reached the limits of what can still properly be called a logic of ideas. On the one hand, in his *Logica* the classical elements of the logic of ideas still play an important role. For instance, the contention that logic takes its principles from psychology is very much in line with a subjectivist tendency that had become an unseparable property of the logic of ideas in the hundred years prior to the publication of Engelhard's *Institutiones*. On the other hand, Engelhard partly places traditional elements of this logic in a new perspective and partly combines them with elements of a revitalized Aristotelianism. A major new perspective is formed by the ontological Principles of Contradiction and Sufficient Reason. These principles are of fundamental importance for all disciplines, including logic. The psychological perspective of having ideas of things becomes overshadowed by the ontological perspective of the things we have ideas of. In a similar way, although the subject of method

[72] Wolff, *Vernünftige Gedanken*, p. 205 (title of chapter): '8. Wie man so wohl seine eigene, als die Kräfte anderer untersuchen soll, ob sie zureichen, eine Wahrheit zu untersuchen, oder nicht'.

[73] Crousaz, *Compendium*, IV. 2, p. 193: '*vel* per se solus investigat, *vel* aliorum adjutus auxilio quærit'.

[74] Engelhard, *Logica*, II. ii. 1, p. 85: 'Quot modis ad veritatis cognitionem pervenimus? Duobus, *vel* meditatione propria, *vel* aliorum accedente auxilio.'

remains prominently present, this is no longer in the guise of the general question of how we can obtain new scientific knowledge, but rather as the more limited problem of how we can form definitions, either non-empirically (*a priori*) or empirically (*a posteriori*), which seem to have largely ousted ideas as the basic elements of systematic reasoning. In reasoning, the much-decried Aristotelian medium of the syllogism is restored to its old place of honour. Finally, Engelhard, in good Dutch fashion, makes his logic even more eclectic than it had already become in the able hands of Wolff, by adding some distinctly Cartesian properties that are related to the *cogito*. Engelhard's Wolffian logic is the culmination of a trend, commenced more tentatively and altogether less convincingly by Crousaz,[75] that sought to combine elements of Aristotelian logic and the logic of ideas in a new synthesis. In the next chapter we shall turn to a Dutch philosopher who was a more orthodox representative of the logic of ideas, in the sense that he remained uncompromisingly anti-Aristotelian.

[75] Although Crousaz attacks the supposedly deterministic and Spinozist tendencies in the philosophy of Leibniz and his follower Wolff, his preference for artificial logic to natural logic, his attention for ontological concepts within a logical framework, and his attempts at accommodation are all in line with the views of the Leibniz-Wolffian school. Yet the *Compendium* does not contain any hard evidence for concrete influence from this direction. (Crousaz's *Système de réflexions* appeared as early as 1712, i.e. one year before Wolff's *Vernünftige Gedanken*—on the other hand, Crousaz's *Compendium* appeared twelve years after the *Vernünftige Gedanken*.)

CHAPTER EIGHT

WILLEM JACOB 'S GRAVESANDE'S PHILOSOPHICAL DEFENCE OF NEWTONIANISM (1736)

8.1. *Introduction*

The Newtonian physicist, mathematician and philosopher Willem Jacob 's Gravesande was born on 27 September 1688 in the Dutch city of 's Hertogenbosch. In 1704 he went to Leiden University, where he and his two brothers matriculated at the Faculty of Law. 's Gravesande's keenest interest, however, were in the field of physics and mathematics and already during his years as a student of law he finished a work called *Essai de perspective*, which however was not published until 1711. After taking his doctoral degree in law with a dissertation in which he argued against suicide (*De autocheiria*, 1707) he took up the profession of lawyer in The Hague. In this city he lost no time in establishing contacts with fellow *savants*; together with Prosper Marchand (1675–1756) and Justus van Effen (1684–1735) he founded the *Journal Littéraire* (1713–1737), thus adding another chapter to the history of French-language journals published in the Dutch Republic (see above, §4.2). In 1715 's Gravesande travelled to London as secretary to a Dutch diplomatic legation. In Britain's capital he found time to continue his scientific pursuits and he was elected a member of the Royal Society, where he witnessed the magnetic experiments of Jean Théophile Desaguliers (1683–1744). 's Gravesande's biographer Jean Allamand (1713–1787) ensures us, however, that his main contact in the Society was the great Newton himself, who showed much 'respect and friendship' for the Dutchman.[1] 's Gravesande's visit to London was of decisive importance for the turn that his career was to take in 1717, when he was appointed professor in mathematics and astronomy at Leiden University.

Newton's *Philosophiæ naturalis principia* had been known in the Dutch Republic from well before 1717. In 1688, one year after the work had appeared, John Locke published a review in Le Clerc's

[1] Allamand, 'Histoire de la vie et des ouvrages de Mr. 's Gravesande', p. xxii.

Bibliothèque Universelle.[2] The lectures on experimental physics by De Volder and W. Senguerd in Leiden (see above, §4.5) probably helped to prepare the ground for Newton. Jean le Clerc would later remember that his friend De Volder had been approached by Christiaan Huygens with the request to give his opinion on the *Principia.*[3] Newton's physics plays an important role in *Het regt gebruik der wereltbeschouwingen* by the Dutch fysico-theologian Bernard Nieuwentijt (1654–1718), who used his private laboratory to confirm the theories of the Englishman; and the oration *De comparando certo in physicis* by Boerhaave contains a vigorous defence of Newton's empirical-mathematical method of Newton. However, Newton's work in the Dutch Republic was not received and diffused as swiftly as Locke's *Essay.* The two works by Nieuwentijt and Boerhaave were published as late as 1715. Although the initial period of incubation and digestion of Newton's work was shorter in the Dutch Republic than elsewhere on the Continent, there was still a delay.[4] This interval can be explained partly by the sheer difficulty of the *Principia* and by Aristotelian reservations, but also by an association of Newtonian gravitation with 'occult' forces that was largely due to Cartesian and Leibnizian objections as expressed by such prominent thinkers as Christiaan Huygens and Johannes Bernouilli.[5]

Although 's Gravesande was not without Dutch precursors, he can be considered the first teacher on the continent to give a full and systematic presentation of Newtonian physics from 1717 onwards. For his teaching he drew on Newton's *Principia Mathematica* and the *Opticks* (1704). He used these works for his magnificently illustrated textbook *Physices elementa mathematica* (1720–1721). In his teaching the accent was more on the experimental than on

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[2] *Bibliothèque Universelle,* 8 (1688) 436–450. On the question of the authorship of the review, see Axtell, 'Locke's Review of the *Principia*', *passim* and Rogers, 'Locke's *Essay* and Newton's *Principia*', p. 228, note 34; cf. Bots, *De Bibliothèque Universelle et Historique,* pp. 378–379.

[3] Ruestow, *Physics at 17th and 18th-Century Leiden,* pp. 110–111.

[4] This situation must have caused some chagrin to the bookseller Pieter van der Aa in Leiden, who had received twelve copies of the *Principia* in commission from the London bookseller Samuel Smith. Van der Aa had tried to sell these books in Frankfurt, but after two years prudence prompted him to send back to London the seven copies that still remained in stock. Not until 1713 would a second edition of the *Principia* be issued in London—however, this time Dutch booksellers were more optimistic about the commercial feasability of the work. A Dutch pirate edition, which would push the London edition from the European market, appeared almost instantaneously. See Hoftijzer, 'Het Nederlandse boekenbedrijf', pp. 70–71.

[5] Gori, *La fondazione,* p. 47 and De Pater, 'Nicolaus Engelhard', p. 144.

the axiomatic-mathematical side of Newton's physics. For his experiments he made use of countless instruments that were constructed specially for him by Jan van Musschenbroek, the brother of his most gifted pupil Petrus van Musschenbroek. Although 's Gravesande was more a teacher than an original investigator, he was no blind imitator of Newton. This point is borne out by his stance in the *vis-viva* controversy. While Descartes and such Newtonians as Samuel Clarke had maintained that the right measure for the effect brought about by a moving body was its mass multiplied by its velocity, Leibniz maintained that this measure consisted of mass multiplied by the *square* of its velocity. 's Gravesande did not acquiesce in the verdict of Newtonian authority, and subsequent experiments brought him to the conviction that Leibniz's formula was correct. These unorthodox views in no way impeded the growth of his reputation. He became a European celebrity and in 1736 's Gravesande could for a short while boast of Voltaire as one of his students. Although he received invitations from abroad, he remained a professor in Leiden until his death in 1742.[6]

8.2. *The* Introductio: *Metaphysics and Logic*

In 1734 's Gravesande was made *professor totius philosophiæ*. This broad assignment resulted, two years later, in the publication of a general philosophical textbook, called *Introductio ad Philosophiam, Metaphysicam et Logicam continens* (1736).[7] The *Introductio* is a fine example of the logic of ideas, and although 's Gravesande's work contains

[6] In 1721, however, 's Gravesande accepted an invitation to visit the court of the Landgrave of Hesse-Kassel, who had a fondness for scientific instruments. There a certain Orssyreus had built a machine that was reportedly able to maintain a *perpetuum mobile*. Allamand, 'Histoire de la vie et des ouvrages de Mr. 's Gravesande', pp. xxiv–xxvi, tells the curious history of 's Gravesande's confrontation with the machine. The Dutchman inspected the device as best a he could, but since he was not allowed to take it apart, he decided to defer judgment on the matter. Yet his meticulous scrutiny threw Orssyreus in such a violent temper that he demolished his machine (thus, one suspects, forestalling further attempts at inspection), writing on a wall that this act of destruction had been brought about by the impertinent curiosity of professor 's Gravesande. Only later, in 1729, did a servant of Orssyreus come up with the allegation that she had kept the machine going by means of a secret device located in an adjacent room. Remarkably enough, when he received news of this increminating testimony by Jean-Pierre de Crousaz, 's Gravesande dismissed it as slanderous, even although he tended to agree with Crousaz that Orssyreus had been a madman.

[7] I use (a modern reprint of) the second edition of 1737.

many traces of influence by Descartes, Arnauld, Malebranche and Locke (he possessed books by all of them),[8] the author presents an original epistemological and methodological defence of Newton's new science in the format of a logical textbook.

The *Introductio* is divided in two books. The first book is on metaphysics and is subdivided into a part on ontology and on the human soul. The first book numbers a mere 105 pages, while the book on logic is 270 pages long. 's Gravesande stresses the preliminary character of metaphysics in relation to logic. Before we can start with the art of reasoning, i.e. logic, it is necessary to envisage things in an abstract and general way. This brings the author to the first part of his metaphysics, in which he discusses ontology. The second part of 's Gravesande's metaphysics, on the human mind, has a preliminary nature as well; before he starts to analyse the operations of our mind in his logic, he wants to examine the general properties of the mind. In this second part 's Gravesande briefly discusses problems related to liberty and to the relation between soul and body. He also mentions (and rejects) Locke's suggestion that God might have created thinking matter.[9] When 's Gravesande later in the *Introductio* comes back to the function of metaphysics, he again stresses its preliminary function in the context of his logic of ideas. Metaphysics is useful because it acquaints us with abstract ideas: 'the study of metaphysics is of special use, if at least confused ideas are removed and if the rest are set forth in their natural order.'[10] 's Gravesande's presentation of a metaphysics that is propaedeutic to logic is unconventional. In

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[8] For 's Gravesande's books see [Anonymous], *Bibliotheca 's Gravesandiana*; for Descartes, see: p. 25, nr 196 and p. 53, nrs 135–139; Arnauld: p. 54, nr 155; Malebranche: p. 24, nr 164 and p. 76, nr 732; Locke: p. 4, nr 62, p. 24, nr 162 and p. 91, nr 1089. For the influence of Locke on 's Gravesande, cf. Israel, *Radical Enlightenment*, p. 524: 'If the Netherlands was the first country on the continent where English ideas came to dominate the Early Enlightenment, this was not until the mid-1720s and even then the role of Locke was rather marginal. Willem Jacob 's-Gravesande, the Leiden professor who did more than anyone else to engineer the triumph of English philosophy and science in the Dutch mainstream Enlightenment in the 1720s, was essentially a Newtonian who turned to Locke only in the 1730s and, even then, never gave much prominence to his ideas.' However, I have detected clear Lockean influences in 's Gravesande's *Physices elementa* (see below, §8.6), and this work was published as early as in 1720–1721. See also above, §5.2, note 29.

[9] 's Gravesande, *Introductio*, I. II. xiii, p. 67: 'Crediderunt Animam nostram esse corpoream, & cogitationes nihil esse præter agitationem partium minimarum Corporis.'

[10] *Ibid.* II. III, xxx, p. 276: 'Ut in his Mens exerceatur, Metaphysices studium peculiarem utilitatem habet; si modò ex hoc ideæ confusæ omnes removeantur, & aliæ ordine naturali exponantur.'

the early modern academic tradition, it had usually been logic that had the propaedeutic function of providing a general training, while one of the ultimate aims had been metaphysical knowledge. When the French translation of 1738 of the *Introductio* was reviewed in the *Journal des Sçavans* of the same year, the anonymous author starts his on the whole very positive review with a critical remark about this curious sequence.[11] We may get a clue of 's Gravesande's motives for this order when we consider the content of his ontology, which includes a brief and largely traditionally Aristotelian review of concepts like substance and mode and of cause and effect. In addition, however, there is a discussion of possibility and impossibility in chapter iv, and of necessity and contingency in chapter v. The content of these short chapters clearly follows a Leibnizian-Wolffian example; the former chapter presents the Principle of Contradiction and the latter chapter deals with of the Principle of Sufficient Reason. We have seen, moreover (§7.3), that one feature of Wolffian philosophy is the complicated relation between ontology and logic. Logic can never so much as begin without acknowledging the ontological Principles of Contradiction and Sufficient Reason. This is probably the background for 's Gravesande's use of ontology as a preliminary to logic, even though his logic itself contains little that is taken from Wolff.

8.3. *Structure*

's Gravesande's logic as presented in the *Introductio* is divided into three parts:

I. On ideas and judgements.
II. On the causes of errors.
III. On method.[12]

Although this structure is different from both the tripartite structure of Aristotelian textbooks and the quadripartite structure of Arnauld's *Logique* and Le Clerc's *Logica*, it can nevertheless be understood as a continuation of its predecessors. 's Gravesande's general aim of the *Introductio* is to direct the mind 'when it devotes itself to the

[11] *Journal des Sçavans* 116 (September 1738) 63: 'Il semble qu'il faut connoître l'ame & ses facultez, avant que de penser à en diriger les operations. Mais d'un autre coté, si l'on n'apprend pas aux jeunes gens les règles de la Logique, comment les suivront-ils dans l'étude de la Métaphysique?'

[12] 's Gravesande, *Introductio*, Index: 'I. De Ideis & Judiciis', 'II. De Causis Errorum' and 'III. De Methodo.'

knowledge of things and to the investigation of truth'.[13] The author's subsequent answer to this problem places him firmly in the camp of the logic of ideas: 'All our judgements and reasoning concern ideas and the science that we are about to discuss [i.e. logic] is concerned with ideas only. So, it is worthwhile to discuss ideas in general as well as to examine their various distinctions.'[14] The two main stages of the logic of ideas, consisting of separate ideas and combinations of ideas, are given in separate series of chapters within the first part (chapters ii–vi are on separate ideas and chapters vii–x are on judgements). The subject-matter of part II, on the causes of errors, belongs to a well-established tradition in logical textbooks that is present in both Aristotelian works and in specimens of the new logic of ideas. 's Gravesande's discussion of method in part III matches similar discussions of the same subject by Arnauld, Le Clerc, Crousaz and Engelhard. The main difference between 's Gravesande and his predecessors is that the three parts of his logic completely omit syllogistic reasoning. He discusses the subject in an appendix to the three main parts of his logic. He leaves the reader in no doubt about his anti-scholastic motivation for this choice. At the end of part I of his logic 's Gravesande writes: 'In [the works of] dialecticians much can be found on this matter that, although not entirely devoid of use, is not necessary for reasoning well.'[15] He then feels obliged to offer an explanation for discussing syllogisms at all: 'Since however the art of argumentation, when considered in itself, is most excellent and eminently useful in convincing others of the error in their reasoning, I shall briefly discuss this art at a later stage, in the Appendix.'[16] Syllogisms have some limited use, but they are not helpful in the discovery of new truths and consequently they play no role in 's Gravesande's discussion of method (see below, §8.8).

[13] *Ibid.* I. I, p. 1: 'dum rebus cognoscendis, & inquisitioni Veri sese tradit'.

[14] *Ibid.* II. I. i, p. 107: 'Judicia nostra, & Ratiocinia omnia, Ideas spectant; & circa has solas versatur Scientia quam tractamus. Operæ prætium ergò erit de Ideis generaliter agere, & harum diversas perpendere distinctiones.'

[15] *Ibid.* II. I. xx, p. 222: 'Plura de his requisitis apud Dialecticos reperimus, quæ, quamvis usu non destituantur, non tamen ad benè ratiocinandum necessaria sunt.'

[16] *Ibid.* II. I. xx, p. 222: 'Cùm tamen Ars Argumentandi, in se considerata, pulcherrima sit, & usum habeat præcipuè in aliis de fallaciâ Ratiocinii convincendis, hanc ipsam posteà, in Appendice, breviter exponam.'

8.4. *Ideas, Judgements and Propositions*

A more detailed investigation of part I of 's Gravesande's logic shows that in the first chapters, concerning individual ideas, the Dutchman has continued the trend away from the Aristotelian tradition that is already clearly present in Arnauld and Le Clerc. 's Gravesande's chapters on simple and complex ideas (II. I. ii) and on abstract ideas (II. I. iv) reflect similar discussions in Arnauld and Le Clerc. On the topic of clear and distinct ideas, however, 's Gravesande is less orthodox. While Descartes had pointed out that distinct ideas form a particular subclass of clear ideas (see above, §2.4), and while Arnauld (§3.1), followed by Le Clerc (§5.4), had defended the identity of these concepts, 's Gravesande maintains that 'manifestly' not all distinct ideas are clear, but that all clear ideas are always distinct.[17] He does not, however, adduce reasons for this particular stance.

In his anti-Aristotelianism 's Gravesande surpasses both Arnauld and Le Clerc. Although the latter had dropped a traditional discussion of the five universals or predicables that had still been discussed, be it reluctantly, by Arnauld (see above, §3.1), he had still maintained Arnauld's grudging discussion of the ten Aristotelian categories. In 's Gravesande's logic these are completely replaced by a largely Lockean discussion of substances, modes and relations. Moreover, 's Gravesande includes a chapter (II. I. vi) on 'ideas of what passes in our soul' that is altogether absent in Arnauld or Le Clerc. In this short chapter 's Gravesande discusses some topics related to the faculties of the understanding (attention, memory, imagination), which does justice to the 'subjective' or psychological side of the logic of ideas.

In the chapters II. I. vii–x 's Gravesande examines the second stage of the logic of ideas, consisting of the comparison of two ideas. He pays special attention to judgements. Like Crousaz, whose logic he owned a copy of,[18] and unlike Locke (see above, §6.6), 's Gravesande uses the term 'judgement' in opposition to 'proposition'. Judgements consist of the comparison between ideas, and proposi-

[17] *Ibid.* II. I. iii, p. 114: 'Ideam claram etiam distinctam semper esse, manifestè patet; sed non omnis distincta clara est. Corporis Idea, quamvis distincta, obscuris tamen adnumerari debet.'

[18] See *Bibliotheca 'sGravesandiana*, p. 50, nr 46.

tions are judgements that are expressed by words.[19] 's Gravesande typically pays scant attention to propositions, and his terseness again has anti-Aristotelian roots: 'The dialecticians have written a lot about the division of propositions. I shall discuss only the small part that seems useful to me. Of the rest I shall mention briefly some important things, but most I shall leave completely untouched.'[20]

The remaining chapters of the first part of 's Gravesande's logic are mainly devoted to various kinds of evidence and to probability. The topic of probability within a logic of ideas is not new. We have seen (§2.1) how Locke divided the second stage of the new logic in certain knowledge and probable knowledge ('opinion'). However, Locke's treatment of probability has a purely qualitative, i.e. non-quantitative character. As a mathematician 's Gravesande cannot be content with a qualitative analysis; he tries to determine various probabilities in a purely quantitative way. Consequently, he uses the chapters on probability (II. I. xvii–xviii)—the historical background of which in the last resort consists of Aristotelian discussions of dialectical syllogisms (see above, §2.2)—for what amounts to an introduction to the modern discipline of statistics.

However original his use of modern science within a traditional structure may be, 's Gravesande's discussion of *evidentia* is even more interesting. In the next two sections I shall argue that this discussion can be read as a philosophical defence of the new Newtonian science; that 's Gravesande makes a very circumspect and qualified use of Locke in this defence; and that these qualifications are related to a fundamental discrepancy between the precise requirements of an effective epistemological and methodological defence of Newtonian physics and the actual content of Locke's *Essay*. Although the essential points of 's Gravesande's argument can all be found in the 'Logica' of his *Introductio*, I shall also refer to his other works in so far as this is relevant to the problem at hand.

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[19] 's Gravesande, *Introductio*, II. I. vii, p. 129: 'Judicium verbis expressum vocatur *Propositio, Effatum, Pronunciatum*, quibus nominibus generaliter designamus omnem Relationem inter duas Ideas, quando hæc verbis exprimitur, quamvis non immediatè precipi possunt.'

[20] *Ibid.* II. I. viii, p. 131: 'Multa de Propositionum Divisione apud Dialecticos habentur; pauca, quæ utilia mihi apparent, explicabo. Præcipua quædam ex reliquis breviter indicabo; sed plura omnino intacta relinquam.'

8.5. *Problems for a Lockean Defence of Newtonian Physics*

Locke's *Essay* has often been hailed as a philosophical defence of the new mechanicist science of nature and of Newtonian physics in particular.[21] Indeed, as early as the later 1690s, British and Continental contemporaries started to mix up the ideas of Newton and Locke.[22] In the subsequent picture of the relation between Locke and Newton, the former was considered as the indebted partner who learned much from the latter, whilst the latter was thought to have learned hardly anything from Locke. A revisionist trend was inaugurated by G.A.J. Rogers, who pointed out that each wrote his most important work independently from the other and that their philosophical views were the result of a common outlook rather than the result of one having greatly influenced the other.[23] I shall now push this trend considerably further, and not only maintain the independent character of Locke's *Essay* in relation to Newton's natural philosophy, but even point to a fundamental obstacle in the *Essay* to a Lockean philosophical defence of Newton's physics. The background for this obstacle is formed by Locke's epistemological distinction between the certain knowledge that can be obtained of modes and to which he assigns a method of geometrical demonstration on the one hand and, on the other hand, the merely probable knowledge that can be gained of material and immaterial substances, for which he commends his 'Historical, plain Method' (see above, §§ 2.1 and 2.5).

Since physics concerns material substances, and since according to Locke substances will not permit more than probable knowledge, while science consists of certain knowledge, we see him, on more than one occasion, uttering serious doubts about the possibility of scientific knowledge in the field of what he calls experimental philosophy, however useful the advances in this discipline may be in our daily life.[24] In addition to this well known reservation, there is another problem that has received less attention and that concerns the question of how to relate Locke's two methods to Newtonian physics. In the preface to the first edition of the *Principia mathematica* Newton

[21] A survey of this traditional view can be found in Rogers, 'Locke's *Essay* and Newton's *Principia*', pp. 217–218.

[22] See Feingold, 'Partnership in Glory: Newton and Locke', p. 297.

[23] Rogers, 'Locke's *Essay* and Newton's *Principia*', pp 217–232.

[24] See Locke *Essay*, IV. iii. 26–29, pp. 556–560 and *ibid.* IV. xii. 10, p. 645; see also McCann, 'Locke's Philosophy of Body', p. 67: 'Locke is unique among the seventeenth-century champions of mechanism in emphasizing the severe limitations on our ability to deliver mechanistic explanations of natural phenomena.'

had written that 'the whole burden of philosophy seems to consist in this—from the phenomena of motions to investigate the forces of nature, and then from these forces to demonstrate the other phenomena'.[25] This method suggests two distinct stages, one having an inductive character and the other having a deductive character. In the 'Queries' to the *Opticks* (1704) these two stages are described as analysis and synthesis respectively:

> The analysis consists in making experiments and observations, and in drawing general conclusions from them by induction, and admitting of no objections against the conclusions, but such as are taken from experiments, or other certain truths ... And the Synthesis consists in assuming the causes discovered, and established as principles, and by them explaining the phænomena proceeding from them, and proving the explanations.[26]

These two elements of Newton's method, analysis and synthesis, coincide roughly with Locke's two methods. Both Locke's plain historical method and Newton's analysis imply a kind of induction,[27] while the former's method of mathematical deduction coincides with the latter's method of synthesis. However, whereas in the case of Newton we are speaking of two stages of one and the same method for one natural philosophy, in the case of Locke we have one method for ideas of substances and another method for modes. Or, to put it in another way: given Locke's fundamental distinction between ideas of substances and modes, and given the two different methods that are associated with these different kinds of ideas, it is difficult to give a Lockean defence of Newtonian physics that can be considered a science and that takes into account the methodological elements of *both* empirical induction *and* mathematical deduction.

Moreover, it should be stressed that the Lockean divide between certain knowledge of modes that can produce science and mere opinion or belief concerning ideas of substances is absolute and not a matter of degrees.[28] Admittedly, Locke gives a detailed discussion

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[25] Newton, *Principia*, vol. I, p. 16: 'Omnis enim philosophiæ difficultas in eo versari videtur, ut a phænomenis motuum investigemus vires naturæ, deinde ab his viribus demonstremus phænomena reliqua.' Transl. Cajori, pp. xvii–xviii.

[26] Newton, *Optics*, in: *Isaaci Newtoni opera*, vol. IV, pp. 263–264.

[27] This does not imply that Locke and Newton agreed on the precise kind of induction. Whereas Locke's induction did go much beyond the rough qualitative observations of a doctor examining his patient, Newton was more bent on the generation of quantitative results, based on reproducible experiments.

[28] See also Ayers, *Locke*, I, pp. 93–94: 'to attribute to Locke the notion of a continuum between knowledge and belief ... would be to fail to take into account the

of the several degrees and grounds of probability *within* the category of probable knowledge, but these degrees in no way impinge on the fundamental '*difference between Probability* and *Certainty, Faith* and *Knowledge*'.[29] Even the highest degree of probability, where 'The concurrent experience of all other Men with ours, produces assurance approaching to Knowledge' still *is* not knowledge.[30] But if Locke does not think that physics can be made into a science, why does he mention φυσική as the first of the three sciences in the general division in the last chapter of the *Essay*? This science is very broad and consists of all things, both material and immaterial, that could possibly be the object of the human understanding. In this general context Locke does not want to deliver verdicts on the possibilities of knowledge of material substances; this is borne out by the qualification about 'whatsoever' in the following quotation: 'The end of this [φυσική], is bare speculative Truth, and whatsoever can afford the Mind of Man any such, falls under this branch, whether it be God himself, Angels, Spirits, Bodies, or any of their Affections, as Number, and Figure, *etc.*'[31] The fact that all these various objects belong to the domain of physics, does not imply that we can have certain knowledge of them. Consequently, Locke's views on physics in this chapter do not contradict his earlier point that 'how weighty and considerable a part soever of Humane Science' the knowledge of material substances may be, it 'is yet very narrow, and scarce any at all'.[32]

Admittedly, each of the three times that Locke mentions Newton in the *Essay*, he seems to be rather more positive about the status of physics. Yet in these rare and late bouts of optimism, based on admiration for Newton's recent achievements, he does not retract his fundamental and older dichotomy between modes and ideas of substances that had been at the basis of his persistent qualms about the possibilities for physics as a science. Locke had started work on his *Essay* as early as 1671, while Newton's *Principia* was published only in 1687. The *Essay* was published two years after the *Principia*, in 1689, but by 1687 most of its content was already in

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absolute nature of his distinction between them'; against this, cf. Ferreira, 'Locke's Constructive Skepticism', pp. 211–212 and Shapiro, *Probability and Certainty*, p. 267, who regards Locke as a main contributor to 'the erosion of the traditional dichotomy between "science" and "probability" between 1550 and 1700'.

[29] Locke, *Essay*, IV. xv. 3, p. 655.

[30] *Ibid.* IV. xvi. 6, p. 661 (title of section).

[31] *Ibid.* IV. xxi. 2, p. 720.

[32] *Ibid.* IV. iii. 10, p. 544.

place.[33] Moreover, in one of his references to Newton in the *Essay*, where he mentions Newton's 'Advancement of Sciences', Locke does not speak about his advances in physical knowledge, but only about Newton's advances in what Locke calls 'Mathematical Knowledge'.[34] This is in line with his distinction between modes and ideas of substances, which implies that knowledge of (mathematical) modes is possible, while knowledge of (physical) ideas is not. In *Some Thoughts concerning Education* (first published 1693) he seems aware of the tension between his early scepticism and Newton's recent triumphs, but here again he stresses the mathematical character of Newtonian physics:

> Though the Systems of *Physicks*, that I have met with, afford little encouragement to look for Certainty or Science in any Treatise, which shall pretend to give us a body of *Natural Philosophy* from the first Principles of Bodies in general, yet the incomparable Mr. *Newton*, has shewn, how far Mathematicks, applied to some Parts of Nature, may, upon Principles that Matter of Fact justifie, carry us in the knowledge of some, as I may so call them, particular Provinces of the Incomprehensible Universe.[35]

Finally, in 'Of the Conduct of the Understanding' (started in 1697) the 'admirable discovery of M^r^ Newton that all bodys gravitate to one an other' is accorded the certain status of 'fundamental truths that lie at the bottom as the bassis [*sic*] upon which a great many others rest', along with 'Our Saviours great rule that we should love our neighbour as our selves'.[36] Locke's tendency to use hyperbolic praise as soon as he comes to speak of Newton is well known and prompted Barbara Shapiro to the observation that 'With the "incomparable Mr. Newton", probability might become certainty. With Newton, Locke leaves the language of the probable, and even the morally certain, for that of demonstration and certitude.'[37] However, this late admiration and its related claims of certainty imply trouble at the very root of Locke's taxonomy of ideas.[38]

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[33] See Rogers, 'Locke's *Essay* and Newton's *Principia*', pp. 220–223.

[34] Locke, *Essay*, IV. vii. 3, p. 599.

[35] Locke, *Some thoughts*, §194, p. 248.

[36] Locke, 'Conduct', par. 84 (§43).

[37] Shapiro, *Probability and Certainty*, p. 60. Cf. Ayers, *Locke*, I, p. 118, who presents a more wary Locke, even when faced with Newton's achievements: 'It [Locke's wariness] helped not only to sweep away "rubbish", but to inject into the interpretation of Newton's admired theory, at its inception, a healthy dose of scepticism and self-criticism.'

[38] One possible Lockean solution for the problems caused by the divide between modes and ideas of substances may be contained by the third category of complex

8.6. *'s Gravesande's Solution*

Now that the problem for a Lockean defence of Newtonian physics has been outlined, we can turn to 's Gravesande's solution of this question. Although 's Gravesande in his *Introductio ad Philosophiam* does not mention Locke by name, he subscribes to various Lockean tenets.[39] More in particular, when trying to give a defence of the scientific character of Newtonian physics, his argument starts with the Lockean distinction that we have identified in the previous section as a major obstacle for any such undertaking in the first place. In the *Introductio* 's Gravesande distinguishes between the *evidentia* (evidentness) of mathematics and other sciences that are concerned with ideas considered by themselves, and the *evidentia* that is provided by ideas of things outside our mind.[40] Although 's Gravesande is here manifestly subscribing to the Lockean criterion for the distinction between modes and ideas of substances, he cannot, however, agree with the subsequent separation between the two methods that are associated with these different categories of ideas.[41] For the Newtonian 's Gravesande it is imperative that both methods should be considered as two mutually related elements of one and the same science. Thus he writes in the 'Præfatio' to the *Physices elementa mathematica* 'In Physics then we are to discover the Laws of Nature by the Phænomena, then by Induction prove them to be general

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ideas, i.e. relations. Relations pertain to ideas of substances as well as modes, and include the physical concepts of cause and effect and of time and place. Morover, 'The *Ideas* then of *Relations are capable* at least *of being more perfect and distinct in our Minds, than those of Substances*' (*Essay*, II. xxv. 8: 322). However, the epistemological and methodological possibilities of a Lockean defence of Newtonian physics along the lines suggested by the category of relations, are explored neither by Locke himself nor by 's Gravesande.

[39] For instance, see 's Gravesande's discussion of identity in the *Introductio*, I. I. vii; also, he muses about our ability to determine 'ubi mortalium cognitionibus limites ponantur', *Physices elementa*, I, p. 11; for a discussion of the Molyneux-problem, see *Introductio*, II. I. xiv, pp. 156–158; finally, compare the reply to scepticism about the existence of material bodies in his *Oratio de evidentia*, in: *Orationes tres*, p. 19, with Locke, *Essay*, IV. ii. 14: 536–538; see also Gori, *La fondazione*, p. 235, n. 18.

[40] 's Gravesande, *Introductio*, II. I. xii, p. 144: 'quæ versantur circa Ideas in se consideratas' and *ibid.* II. I. xiii, p. 148: 'Ideas rerum, extra mentem'.

[41] Strictly speaking, 's Gravesande uses the Lockean criterion for the disctinction between modes and ideas of substances not for the terms 'mode' and 'substance' themselves (these terms are defined in a conventional Aristotelian way, see *Introductio*, I. I. ii, p. 8), but for the distinction between different kinds of sciences, i.e. mathematics and physics. For 's Gravesande on mathematical and moral *evidentia* see also De Pater, ''s Gravesande on Moral Evidence', *passim*.

Laws; all the rest is to be handled Mathematically.'[42] Indeed, it is in this preface that we witness the exact point at which 's Gravesande begins to diverge from Locke's views. He still echoes Locke's reservations about the possibility of knowledge of substances when he writes 'What Substances are, is one of the things hidden from us. We know, for instance, some of the Properties of Matter; but we are absolutely ignorant, what Subject they are inherent in.'[43] However, while still striking Lockean chords about the limits of human knowledge, he then continues:

> The Study of Natural Philosophy is not however to be contemn'd, as built upon an unknown Foundation. The Sphere of humane Knowledge is bounded within a narrow Compass ... Though many things in Nature are hidden from us; yet what is set down in Physics as a Science, is undoubted. From a few general Principles numberless particular Phænomena or Effects are explain'd, and deduced by Mathematical Demonstration ... How much soever then may be unknown in Natural Philosophy, it still remains a vast, certain, and very useful Science.[44]

While Locke would have subscribed to the proposition 'that what is set down in Physics as a Science, is undoubted', he would have continued with the sceptical remark that hardly anything that actually *is* set down in physics will meet this criterion. 's Gravesande, on the other hand, is more optimistic and describes natural philosophy as a 'vast' science. In other words, although 's Gravesande uses Locke's criterion for the distinction between science and probability, he does not share Locke's reservations about physics as a science.

's Gravesande's argument for the scientific status of Newtonian physics consists of three steps. In the first step he claims that the propositions of the new physics produce not mere probability, but moral

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[42] 's Gravesande, *Physices elementa*, p. x: 'In physicis ergo per Phænomena naturæ leges sunt detegendæ; per inductionem pro generalibus habendæ; de cetero mathematice ratiocinandum.' Transl. Desaguliers, p. xvi.

[43] 's Gravesande, *Physices elementa*, p. iv: 'Substantiæ quid sint inter nobis ignota referendum est. Quasdam ex. gr. materiæ proprietates novimus, sed in quo subjecto hæreant hæ nos omnino latet.' Transl. Desaguliers, p. xi;see also 's Gravesande, *Introductio*, I. I. ii, p. 8.

[44] 's Gravesande, *Physices elementa*, pp. v–vi: 'Non tamen, ut ignoto fundamento nixum, contemnendum Philosophiæ naturalis studium. Limitibus arctis circumscribitur mentis humanæ cognoscendi capacitas ... Si in Physicis nos multa latent, quæ in hac scientia traduntur certa sunt. Ex paucis generalibus principiis innumera Phænomena peculiara explicuntur; hæcque ex illis mathematicâ demonstratione deducenda sunt ... Quæcumque ergo habeat ignota Physica, vasta & certissima est, nihilominus hæc scientia, & maxime utilis.' Transl. Desaguliers, pp. xii–xiii.

evidentia. Evidentia is 'the criterion of truth'.[45] Moral *evidentia* can be produced by propositions that suppose a relation between ideas and things outside our minds. By contrast, mathematical *evidentia* refers only to comparisons between ideas and other ideas.[46] The terminology of 's Gravesande's distinction between moral and mathematical *evidentia* goes back to Descartes' distinction, made at the end of the *Principia philosophiæ*, between moral certainty and absolute certainty. The difference between these types of certainty is expressed more clearly in the French translation of the *Principia* by the Abbé Picot (1647), authorized by Descartes himself, than in the Latin original. In the French version, it is stated that 'moral certainty is certainty which is sufficient to regulate our behaviour, or which measures up to the certainty we have on matters relating to the conduct of life which we never normally doubt, though we know that it is possible, absolutely speaking, that they may be false'.[47] Against this, 'Absolute certainty arises when we believe that it is wholly impossible that something should be otherwise than we judge it to be.'[48]

The most curious thing about Descartes's distinction between moral and absolute certainty was perhaps the way he applied it to physics. He ascribed absolute certainty, not merely moral certainty, to the principles of his physics (see above, § 2.5).[49] 's Gravesande, by contrast, adheres to the Lockean distinction between modes and ideas of substances. He puts the entire field of phyics in the category of ideas of substances and ascribes mere moral *evidentia* rather than mathematical *evidentia* to physics. At the same time, however, he tries to secure the epistemological status of his Newtonian physics by giving a new and stronger definition of 'moral *evidentia*'. He makes a distinction between this concept and what Cartesians and others had called 'moral *certainty*'. According to 's Gravesande, the common meaning

[45] 's Gravesande, *Introductio*, II. I. xii, p. 143: '*Evidentiam esse Criterium Veri*'.

[46] *Ibid.* II. I. xiii, p. 149 and id. *De evidentia*, p. 20: 'Videtis, AA. NN. Moralem Evidentiam, persuasionemque inde oriundam, spectare ad convenientiam inter ideas in Mente nostra & res ipsas extra nos; dum Mathematica Evidentia versatur circa convenientiam quæ datur inter comparationem idearum & quam habemus hujus, comparationis idearum.'

[47] Descartes, *Principes*, IV. 205, AT IX-B, p. 323: 'c'est à dire suffisante pour regler nos moeurs, ou aussi grande que celle des choses dont nous n'auons point coustume de douter touchant la conduite de la vie, bien que nous sçachions qu'il se peut faire, absolument parlant, qu'elles soient faussent'. Transl. CSM, I, p. 289, note 2.

[48] Descartes, *Principes*, IV. 206, AT IX-B, p. 324: 'L'autre sorte de certitude est lors que nous pensons qu'il n'est aucunement possible que la chose soit autre que nous la jugeons.' Transl. CSM, I, p. 290.

[49] Descartes, *Principes*, IV. 206, AT IX-B, p. 324.

of 'moral certainty' is no more than 'great probability'. Against this, he maintains that the persuasion that follows moral *evidentia* is as great as the persuasion that follows mathematical *evidentia*.[50] As a consequence, since moral *evidentia* is different by nature from mere high probability, it is discussed in a separate chapter (II. I. xii).

What remains, of course, is the question how 's Gravesande defends his strong claims about moral *evidentia*. This problem is addressed in the second step of his argument. He holds that moral *evidentia* can be produced only after a circumspect use of our senses, of testimony and of analogy. Firstly, concerning the senses, he points out that since there is no necessary connection between things themselves and the ideas of these things produced by our senses, we should attempt to make frequent and repeated observations and compare the ideas that are produced by our different senses. When the observations of several senses coincide, the chance of making an error is very slight. 's Gravesande rejects the opinion of philosophers who, from the fact that our individual senses sometimes lead us to error, conclude that all sensory knowledge is imperfect.[51] Secondly, he stresses the importance of testimony, provided that the witness was not deceived himself; that he has not tried to deceive us; that he expresses his thoughts clearly; and that he is clearly understood.[52] Thirdly, reasoning that is based on analogy can produce knowledge that is certain. Analogy is based on the general principle that the universe is governed by general and constant laws, which implies that the same causes have the same effects.[53] These three principles are mutually related one to the other, and moral *evidentia* will only be produced when they are used jointly.[54]

It is not difficult to discern influences of Locke on 's Gravesande's discussion of the senses, of testimony and of analogy. In book IV, chapter xv, 'Of Probability' of the *Essay*, Locke states that

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[50] 's Gravesande, *Introductio*, II. I. xvii, p. 182: 'Cùm autem utriusque fundamentum sit firmum, plena etiam est persuasio quæ Moralem Evidentiam sequitur'. 's Gravesande's distinction between 'certainty' and '*evidentia*' is not only different from Descartes, but also from Locke, who seems to use 'Certainty, Evidence' as synonyms, *Essay*, I. i. 3, p. 44, see also *ibid.* II. xi. 1, p. 155; *ibid.* IV. ii. 1, p. 531; *ibid.* IV. ii. 14, p. 538; *ibid.* IV. vii. 4, p. 593; *ibid.* IV. vii. 10, p. 597; and *ibid.* IV. vii. 12, p. 604.

[51] 's Gravesande, *Introductio*, II. I. xiv, p. 168: 'Qui ita ratiocinantur, falsam sibi ideam formant beneficiii, à rerum Moderatore summo, concessi, quando Sensus Hominibus dedit.'

[52] *Ibid.* II. I. xv, pp. 170–177.

[53] *Ibid.* II. I. xvi, pp. 177–179.

[54] *Ibid.* II. I. xvi, p. 180: 'Separatim tria Principia Evidentiæ Moralis tractavimus; in examine rerum tamen non separantur.'

the grounds of probability are 'conformity with our own Experience, or the Testimony of others Experience'.[55] And in the next chapter, on the degrees of assent, he points out that 'In things which Sense cannot discover, Analogy is the great Rule of Probability'.[56] 's Gravesande's discussion of analogy, however, based on the principle that the universe is governed by general and constant laws, is taken from Newtons 'Regulæ philosophandi'. In the Second Rule Newton states that 'to the same natural effects we must, as far as possible, assign the same causes'[57] and in his comment on the Third Rule he stresses that we are not 'to recede from the analogy of Nature, which is wont to be simple, and always consonant to itself'.[58]

In spite of Locke's influence on 's Gravesande's use of the triad of senses, testimony and analogy, a fundamental difference between the two remains. Where 's Gravesande introduces the notion of moral *evidentia*, which is certain, Locke had only claimed that belief based on the coinciding reports of our senses and of testimony 'rises to *Assurance*', but still *is* not knowledge. In the third and last step of his argument, 's Gravesande tries to give the Lockean triad, and the category of moral *evidentia* with it, a certain foundation. Although he claims that the moral *evidentia* of Newtonian physics is as strong as mathematical *evidentia*, he admits that this *evidentia* is produced in different ways. In the case of mathematical ideas, and other modes, certainty can be produced directly, by a comparison of the ideas in our mind. The moral *evidentia* of Newtonian physics, on the other hand, is based on a divine guarantee of the reliability of the Lockean triad.

In the *Introductio* 's Gravesande points out that God, in his sovereign goodness, has given us an abundance of goods during our brief sojourn on Earth; that by giving us senses He has enabled us to make use of these goods; and that He would contradict himself if He would lead into error the very creatures to whom He has accorded these goods. Our senses lead us to the knowledge of truth because this is the wish of God. Thus, there can be complete persuasion about the conformity between things outside us and the sensory

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[55] Locke, *Essay*, IV. xv. 4, p. 655 (title of section).

[56] Locke, Essay, IV. xvi. 12, p. 665 (title of section).

[57] Newton, *Principia*, vol. II, p. 550: 'effectum naturalium ejusdem generis eædem assignandæ sunt causæ, quatenus fieri potest', transl. Cajori, p. 398.

[58] Newton, *Principia*, vol. II, p. 553: 'nec a naturæ analogia recedendum est, cum ea simplex esse soleat & sibi semper consona', transl. Cajori, pp. 398–399; see also De Pater, 'Inleiding', to *Willem Jacob 's Gravesande*, p. 44 and id. 'Willem Jacob 's Gravesande (1688–1742) and Newton's *Regulæ philosophandi*', *passim*.

ideas by which these things are represented.[59] In a similar way God has made the use of testimony and the use of analogy marks of truth.[60] These observations lead 's Gravesande to what has been aptly called his 'survival-axiom'.[61] This axiom is expressed most elegantly in his *Physices elementa*: 'We must look upon as true, whatever being denyed would destroy civil Society, and deprive us of the Means of Living.'[62] This rule and its percerceived relation with the analogy of nature proved very influential, especially in France, where it found a place in the *Encyclopédie*.[63] So, after as a first step claiming moral *evidentia* for Newtonian physics, and after, as a second step, underpinning this claim with Locke's triad, 's Gravesande in the third and last step of his defence tries to give an ultimate and solid foundation for this triad and thus also for the moral *evidentia* that it is supposed to produce, by formulating the survival axiom.

There are several possible sources for 's Gravesande's survival axiom. A version of this axiom had already been produced by the British theologian and scientist Humphry Ditton (1675–1715) in his *Discourse concerning the Resurrection of Jesus Christ* (1712). Since Ditton tries to show the truth of Christ's resurrection, and since this doctrine is based on testimony, he gives special attention to this form of proof. He goes to great lengths to show that 'There is no Decrease of the Probability or Credibility of Testimony deliver'd by faithful, careful, and knowing Witnesses; tho propagated through a Series of Ages, ever so far continu'd'.[64] It is thus with a distinctly theological agenda that he formulates the survival axiom:

> And because the Author of Nature has not made the World after such a manner, nor cannot permit that we should be deceiv'd, in Cases where it is made strictly just and rational for us to yield the Assent of our Minds: Therefore, we can be sure, *That in all Cases (especially in those of great Importance) where the Evidences come up to those Conditions; we shall not be deceiv'd, in assenting to the Truth of things, as made out to us by those*

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[59] 's Gravesande, *Introductio*, II. I. xiii, pp. 151–152: 'Sensus ergo sunt Criterium Veri; quia Deus hoc ita voluit; quare Persuasio de convenientiâ Idearum, quas Sensibus acquirimus, cum rebus quas repræsentant, integra est.'

[60] *Ibid.* II. I. xiii, pp. 153–154.

[61] The term 'overlevingsaxioma' is used by De Pater in his 'Inleiding', to *Willem Jacob 's Gravesande*, p. 41.

[62] 's Gravesande, *Physices elementa*, p. viii: '*Pro vero habendum omne, quod si negetur, societas inter homines destruitur, aut his vivendi ratio adimitur.*' Transl. Desaguliers, p. xv.

[63] See Hooykaas, *Rede en ervaring*, p. 45; see also Gori, *La fondazione*, pp. 154–159.

[64] Ditton, *A Discours*, p. 164.

> *Evidences.* And from all this, we can fairly conclude, *That the Foundations of Moral Evidence ... are not precarious and uncertain, but most securely laid, in the nature and Order of things.* Q.E.D.[65]

A long and admiring abstract of Ditton's book had been published shortly after its appearance in the *Journal litéraire*,[66] i.e. the journal that 's Gravesande had established himself in 1713 and that would make a substantial contribution to the early spread of Newton's physics in Europe. 's Gravesande's biographer Jean Allamand (1713–1787) assumes that he was the author of the review.[67] However, 's Gravesande might have hit on his theologically based survival axiom without the direct help of Ditton. The use of God's properties as an epistemological guarantee for certain or at least probable knowledge of nature is present in various forms in the works of Descartes, Locke and Newton.

Descartes's experiment of radical doubt leaves him with the Archimedean point of the *cogito*; he then uses the existence of his own mind to prove the existence of God. God is the source of all truth, and God guarantees that we will not be deceived in all things of which we have a very clear and very distinct perception. In the preface to the French edition of the *Principia philosophiæ* Descartes states that he has used these metaphysical principles to deduce the principles of his physics (see also above, §2.5).

When Locke discusses the uses of analogy in the *Essay*, IV. xvi.12, he points to the existence of a great chain of being that seems to warrant the use of analogy:

> Observing, I say, such gradual and gentle descents downwards in those parts of the Creation, that are beneath Man, the rule of Analogy may make it probable, that it is so also in Things above us, and our Observation; and that there are several ranks of intelligent Beings, excelling us in several degrees of Perfection, ascending upwards towards the infinite Perfection of the Creator, by gentle steps and differences, that are every one at no great distance from the next to it.[68]

Locke here only mentions the existence of spiritual beings above us, but the context of the section leaves no doubt that the existence of gradual connections, which allows the use of analogy, applies not only to 'immaterial Beings without us' but also to the invisible micro-

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[65] Ditton, *A Discourse*, p. 188.

[66] *Journal Litéraire* I (1713) 391–435 (edition used here is the second edition, The Hague: T. Johnson, 1716).

[67] Allamand, 'Histoire de la vie et des ouvrages de Mr. 's Gravesande', pp. lvii–lviii.

[68] Locke, *Essay*, IV. xvi. 12, p. 666.

structural causes of the 'Works of Nature'.[69] Moreover, Locke's belief in a great chain of being is part of a world view in which 'the infinite Power and Wisdom of the Maker'[70] has created a universe that can be understood because He has imposed the same order on different levels; and this assumption is also at the heart of 's Gravesande's survival axiom.[71]

Similar views pervade Newton's 'Regulæ philosophandi'. In the First Rule he writes 'We are to admit no more causes of natural things than such as are both true and sufficient to explain their appearances' and in the explanation to this rule he continues: 'To this purpose the philosophers say that Nature does nothing in vain, and more is in vain when less will serve; for Nature is pleased with simplicity, and affects not the pomp of superfluous causes'.[72] This simplicity of nature, which forms the foundation of 'the analogy of Nature' in the Third Rule, is a reflection of God's simplicity; here again, the possibility of explaining the physical world is given theological sanction.[73]

8.7. *Error*

After the discussion of ideas and judgements in part I of his logic, 's Gravesande proceeds with a review of the causes of error in part II. We have seen (§2.2) that in the Aristotelian textbook of Sanderson error is discussed at the end, where a discussion of demonstrative (certain) and dialectical (probable) syllogisms is followed by an analysis of sophistical (contentious) syllogisms. This structure still casts its long shadow over the logic of ideas of 's Gravesande, who continues his consideration of certain and probable knowledge (in part I) with an examination of the origin of errors (part II). The internal structure of the part on error is not new either. In his *Logique* Arnauld had started with a conventional discussion of sophisms

[69] *Ibid.* IV. xvi. 12, p. 665.

[70] *Ibid.* III. vi. 12, p. 447.

[71] See also McGuire, 'Atoms and the "Analogy of Nature"', pp. 33–35.

[72] Newton, *Principia*, vol. II, p. 550: '*Causas rerum naturalium non plures admitti debere, quam quæ & veræ sint & earum phænomenis explicandis sufficiant.* Dicunt utique philosophi: Natura nihil agit frustra, & frustra sit per plura quod fieri potest per pauciora. Natura enim simplex est & rerum causis superfluis non luxuriat.' Transl. Cajori, p. 398.

[73] See McGuire, 'Atoms and the "Analogy of Nature"', pp. 36–42 and Rogers, 'Newton and the Guaranteeing God', pp. 221–235.

that is followed by an analysis of errors made in what he calls *la vie civile*,[74] but which can be described more accurately as the kind of errors that are relevant to the new logic of ideas (see above, §3.1). Part II of 's Gravesande's logic is conceived in a similarly hybrid way, but again it makes larger strides away from the peripatetic tradition than Arnauld's logic did. Most of part II is devoted to errors that are relevant to 's Gravesande's logic of ideas. Only in the very last chapter (II. II. xxviii) does the author take the trouble of devoting some pages to sophisms.

's Gravesande starts the part on error with references to definitions of error given earlier in the *Introductio*. These definitions fit a context that is formed by a two-stage logic of ideas. On one of these earlier occasions he made the following remarks about error:

> In all these cases ... error can arise only when *evidentia* is neglected. This can be done in regard to ideas or to judgements. In an idea, error arises when in addition to what we perceive immediately of the thing, something more is added as if it belonged to the thing ... In judgements, error arises when we ascribe a relation to some ideas that on examination belongs to other ideas.[75]

His distinction between individual ideas and judgements (on the same pages he also includes 'reasonings') coincides with the distinction between errors of the first type and errors of the second type as described in Locke's 'Conduct' (see above §2.1). 's Gravesande's subsequent analysis of causes of error contains chapters on authority, the passions, pride, laziness and confusion. Much of the content of these chapters is similar to what can be found in Arnauld's *Logique* and in Locke's *Essay* or 'Conduct'. For instance, there is a Lockean quirk against scholars who confuse reading with knowing and there is also a discussion of Locke's concept of the association of ideas,[76] or, in 's Gravesande's terms, *ideas connexas*.[77]

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[74] Arnauld, *Logique*, III. xx, p. 260 (title of chapter).

[75] 's Gravesande, *Introductio*, II. I. xii, pp. 145–146: 'In his omnibus ... Error tantùm dari potest, quando Evidentia negligitur. Hoc autem fieri potest, respectu Idearum, aut respectu Judiciorum. Error in Ideâ datur, quando, præter illud quod immediatè de re percipimus, aliquid ulterius suppletur, quasi in ipsâ re daretur ... In Judiciis error datur, quando ad quasdam Ideas referimus Relationem, quam in examine aliarum percepimus.'

[76] *Ibid.* II. II. xxiv, pp. 246–247; cf. Locke, 'Conduct', par. 63 (§29).

[77] 's Gravesande, *Introductio*, II. II. xxvi, p. 257.

8.8. *Method*

The heart of part III of 's Gravesande's 'Logica', on method, consists of a discussion of the analytical and the synthetical method. However, the author first gives some preliminary chapters that place method unambiguously in the context of the logic of ideas. Anyone who wants to apply himself to the search after truth should be in a disposition of complying only with what is evident. Consequently, it is desirable to augment those faculties of the mind that are most vital for this search. These faculties are: '(1) That of considering several ideas together. (2) That of finding intermediate ideas when ideas cannot be compared immediately.'[78] Here we have a typical example of the vital relation between faculties and ideas that is so typical for the logic of ideas, while the stress on finding intermediate ideas is characteristic for Lockean guises of this logic, although we have detected this terminology also in Arnauld's *Logique* (§3.1).

's Gravesande continues his preliminary remarks on method with a chapter (II. III. xxx) on the general ways to augment our intelligence. This should be done by practice. 's Gravesande's starts with the manifest importance of bodily exercise: 'As to our body, compare a farmer who hardly ever uses his feet for anything else but following his plough, with a dancer who is skilled in his art. How immense is the difference!'[79] This dexterity 'is mostly ascribed to some natural instinct, while in fact it is manifestly due to art acquired by continued practice.'[80] Practice produces the habit that the teacher wants to install in his pupil. As a result, a musician playing his instrument moves his fingers without himself even noticing.[81] This process is at work not only in the faculties of the body, but also in those of the understanding. Practice within the framework of the logic of ideas first of all pertains to ideas. We should start with the examination of a few ideas. When the mind has become used to these few ideas, it can add more, etc.[82]

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[78] *Ibid.* II. III. xxix, p. 269: 'Sunt hæ (1) Plures ideas simul considerandi. (2) Ideas medias inveniendi, quando ideæ immediatè conferri non possunt.'

[79] *Ibid.* II. III. xxx, p. 270: 'Si de corpore agatur, confer rusticum, qui pedibus vix unquam usus est, nisi ut aratrum sequeretur, cum in arte suâ perito saltatore: quàm immensa est differentia!'

[80] *Ibid.* II. III. xxx, p. 271: 'instinctui cuidam naturali motus hicce plerumque tribuitur, cùm tamen arti, exercitio continuato acquisitæ, manifestè debeatur.'

[81] *Ibid.* II. III. xxx, p. 271: 'ut musicus digitos regulariter agitat, dum vix percipit, se ad hoc, quantumvis parùm, attendere.'

[82] *Ibid.* II. III. xxx, p. 272: 'Ut exercitio augeatur ipsa Mentis Intelligentia, primùm

's Gravesande's predilection for practice as an alternative for a passive trust in our innate capacities, and his parallel between bodily and mental practice, have a Lockean ring. 's Gravesande's examples of the farmer and the musician recall a similar passage in Locke's 'Conduct':

> A midle aged plough man will scarce ever be brought to the cariage and language of a Gentleman though his body be as well proportioned his joynts as supple and his natural parts not any inferior. The legs of a danceing master and the fingers of a musitian fall as it were naturally without thought or pains into regular and admirable motions.[83]

The same influence may be present in 's Gravesande's insistence on the instrumental value of arithmetic and algebra in making the mind capable of finding intermediate ideas.[84]

's Gravesande concludes his preliminary methodological chapters with a discussion of attention and memory, which runs along well-trodden paths. Like Le Clerc, he takes his consideration of sensorial ideas and of the passions in their dual roles of furthering attention and as disturbing factors from Malebranche (see above, §§3.2 and 5.6). The chapter on memory again gives a largely Lockean psychology. Our memory can be of great help in providing us with the intermediate ideas we are looking for, and this faculty can be greatly augmented by constant practice.[85]

After these preliminary chapters, 's Gravesande continues with the analytic and the synthetic methods, which are treated in a predominantly Cartesian fashion. His six rules for analysis largely echo Malebranche (see §3.2), but not as completely as had been the case with Le Clerc.[86] 's Gravesande's sixth and last rule of analysis deserves special mention; it is formulated with an eye to the special nature of investigations that belong to the domain of moral, as opposed to mathematical, *evidentia.*

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paucæ simul ipsi ideæ proponendæ sunt; ubi assueta erit has considerare, & inter se conferre, plures ipsi offeri debent, ut & his simul considerandis assuescat; sicque ordine procedendo, ingenium omne extendi poterit.'

[83] Locke, 'Conduct', par 6 (§4).

[84] 's Gravesande, *Introductio,* II. III. xxx, p. 274: 'In Arithmaticâ & Algebrâ detegimus quæ in inveniendi arte requirituntur.' Cf. Locke, 'Conduct', par, 17 (§6): 'would you have a man reason well you must use him to it betimes exercise his minde in observeing the connection of Ideas and following them in train. Noe thing does this better than Mathematicks.'

[85] 's Gravesande, *Introductio,* II. III. xxxii, p. 281.

[86] 's Gravesande's first, third and fourth rules, *Introductio,* II. III. xxxiii, p. 289, p. 291 and p. 293, repeat Malebranche's first, second and third rules.

> Whenever we deal with external objects of which we have knowledge which belongs to moral *evidentia*, we should never apply our conclusions (however much these are deduced by a valid reasoning from true ideas) to these things themselves, unless it is established by observation that nothing else, which was not considered in the reasoning, prohibits the conclusion to follow.[87]

The upshot of this rather elliptic formulation is probably that in the realm of moral *evidentia* we should take care to refrain from generalizations about an object without first considering the particular circumstances that could falsify these generalizations. That this is indeed 's Gravesande's point is borne out by his example for this rule: 'We can conclude that a given wooden box can contain a certain iron ball once we know the form and size of the box and the diameter of the ball, but this conclusion can no longer be applied once the ball happens to be hot.'[88] The author here seems to touch on the problem of the limited validity of inductions in *rerum natura*. In his further explanation we see that the *caveat* of the sixth rule is intimately linked to a Lockean secpticism concerning our knowledge of substances: 'Much about the things discussed here remains hidden to us', and these unknown properties can easily refute conclusions that are based merely on the limited amount of ideas that are known.[89] 's Gravesande did not copy the rules of his fellow logicians unthinkingly; he understood that his brand of Lockean 'substantial agnosticism' raised questions that had been taken for granted by his more optimistic Cartesian predecessors. The sixth rule shows his awareness of these problems.

By way of corollary to analytical reasoning, 's Gravesande devotes a separate chapter (xxxiv) to hypotheses, which are said to be of great assistance in discovering new truths. A hypothesis is 'a figment which is an answer to the stated question'.[90] We reason on this fiction as if

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[87] 's Gravesande, *Introductio*, II. III. xxxiii, p. 299: 'Quoties agitur de rebus extra nos existentibus, & quarum Cognitio ad Evidentia Moralem pertinet, nunquam debemus Conclusiones, quamvis valido Ratiocinio ex ideis veris deductas, ad res ipsas applicare, nisi ex Observationibus constet, non aliud quid, quod in Ratiocinio non fuit consideratum, impedire quò minùs Conclusio procedat.'

[88] *Ibid.* II. III. xxxiii, p. 300: 'Pixis datur lignea; hac includi posse globum datum ferreum, ex notis pixidis figurâ, & magnitudine, ut & globi diametro, concludi potest; sed conclusio determinato globo applicari non poterit, si h[ic] candens fuerit.'

[89] *Ibid.* II. III. xxxiii, p. 300: 'Multa nos latent, quæ pertinent ad res de quibus hìc loquimur; & facilè quid, quod ignotum est, potest mutare Conclusionem, quæ sequitur ex ideis solis consideratis.'

[90] *Ibid.* II. III. xxxiiv, p. 301: 'Per Hypothesin intelligimus figmentum aliquod, quo Quæstioni propositæ respondetur.'

it were true, but we should accept the resulting solution only after we have checked whether it is indeed true. Hypothetical reasoning should pay heed to the following six rules:

1. The subject of the question should be carefully examined; and we should have ample knowledge of the subject.
2. We should select some circumstances that have something especially noticeable.
3. From these [circumstances] we should again select one [circumstance] and we should investigate some ways in which it could come about.
4. We should check whether these are causes from which the other circumstances, mentioned above in rule 2, do [also] follow. If such a cause is present, than this is the hypothesis that we have to explore further.
5. The hypothesis should be explored by applying it to all the other circumstances that were observed, until it is established whether it satisfies all these circumstances as well.
6. The hypothesis should be examined and consequences should be deduced from it so that new phenomena can be uncovered, and then it should be checked whether these [phenomena] in fact take place.[91]

's Gravesande shares Newton's aversion to hypotheses when these amount to conjectures that are not based on mathematical reasoning or empirical fact.[92] 's Gravesande's evaluation of hypotheses is rather more positive, however, when they are framed in accordance with his rules. When he mentions Christiaan Huygens's hypothesis concerning a ring around the planet Saturn, 's Gravesande notes with admiration that Huygens managed to change this hypothesis into a certain demonstration; the phenomena that were deduced from this hypothesis turned out to be in complete accordance with empirical observations.[93]

As one of the special uses of hypotheses 's Gravesande mentions the case 'when we undertake to determine what men could have

[91] *Ibid.* II. III. xxxiv, pp. 301–305: '1. Accuratè subjectum, circa quod versatur Quæstio, examinandum est; & hujus cognitio satis ampla desideratur', '2. Inter circumstantias, debemus quasdam seligere præcipuas, quæ nempe præ aliis aliquid notabile habent', '3. Ex his, iterum una separatur; & quæruntur quidam modi, quibus locum hæc habere potest', '4. Examinandum an, inter has causas, quædam detur, ex quâ reliquæ circumstantiæ, ex præscripto Regulæ secundæ separatæ, sequantur; si talis detur, ipsa efficit Hypothesin explorandam', '5. Exploratur Hypothesis, hanc applicando omnibus aliis circumstantiis notis; ut constet, an & hisce omnibus satisfaciat' and '6. Ipsa Hypothesis est examinanda, & ex hac consequentiæ deducendæ sunt, ut nova Phœnomena detegantur; & explorandum, an hæc reverà locum habeant.'

[92] *Ibid.* II. III. xxxiv, p. 307: 'cùm vir ille summus nihil posuerit, quod non, ratiocinio Mathematico, ex indubitatis Phœnomenis fuerit deductum; nullâ admissâ, ne quidem explorandâ, Hypothesi'.

[93] *Ibid.* II. III. xxxiv, pp. 303–304.

in mind and what could push them to act'.[94] This particular use of hypotheses is explained in the next chapter (xxxv), where 's Gravesande gives an elaborate and shrewd example of how certain results can be obtained by hypothetical reasoning when his six rules are used in breaking cryptographic codes, which indeed is an example of trying to explain 'what men could have in mind'. 's Gravesande's predilection for the use of hypotheses in breaking cryptographic codes is based more on an Arnauldian understanding of analysis as a way of logical reasoning, than on a Newtonian use of analysis as the first stage in the scientific investigation of nature. The importance of 's Gravesande's discussion of hypothetical reasoning as an instance of analysis resides in the fact that here again, as in the case of his statistical treatment of the concept of probability, he includes innovative and fruitful contributions within the traditional structure of a logical textbook. A hundred years after he had written his *Introductio*, the cryptographic use of his hypothetical rules was still deemed interesting enough to be included in a manual for diplomats.[95]

Finally, after 's Gravesande's discussion of analysis in general and the use of hypotheses in particular, the chapter on the synthetical method (*Introductio*, II. III. xxxvi), used when we want to explain something to others that we know ourselves already, is not very remarkable. His ten rules for synthesis contain many elements that are also present in Arnauld. For instance, in the first rule, in which he stresses the importance of explaining every word that might contain the least obscurity, he makes the typically Arnauldian distinction between definitions of names and definitions of things.[96] Yet for the mathematician 's Gravesande the synthetical method is first of all the geometrical method of Euclid. Accordingly, 's Gravesande's rules for synthesis betray more traces of a direct affinity with the much admired Greek himself than with any representative of the modern logic of ideas.

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[94] *Ibid.* II. III. xxxiv, p. 307: 'Ars ratiocinandi per Hypotheses præcipuè locum habet, ubi determinare suscipimus, quid homines in Mente habeant, & quid ipsos ad agendum impellat.'

[95] Martens, *Guide diplomatique*, 'De l'usage des hypothèses dans l'art de déchiffrer', pp. 381–391, quoted in: De Pater, *Willem Jacob 's Gravesande*, p. 152.

[96] 's Gravesande, *Introductio*, II. III. xxxvi, p. 323; cf. Arnauld, *Logique*, I. xii, p. 86.

8.9. *Conclusion*

's Gravesande's anti-Aristotelian logic of ideas contains several innovative epistemological and methodological discussions within the traditional format of a logical textbook. This holds true for his statistical treatment of the concept of probability and also for his scrutiny of hypothetical reasoning as an instance of analysis. Most interesting, however, is his philosophical defence of Newtonian physics. Instead of considering Locke's *Essay* as a philosophical defence of the new science, I have pointed to the distinction between modes and ideas of substances as a fundamental impediment to any such venture. 's Gravesande could have circumvented the problem by producing a defence in which this distinction is eliminated altogether. However, we have seen how he holds on to this basic tenet of Locke. His solution for the subsequent problems that are caused by the chasm between modes that allow mathematical certainty and ideas of substances that allow mere probability, is the generation of a separate and intermediate category of moral *evidentia*. This category pertains not to modes but to ideas of substances and yet it claims *evidentia*. This moral *evidentia* is not based on a simple and direct examination of our ideas, as is the case with modes, but on the triple use of senses, testimony and analogy, which in its turn is based on a divinely guaranteed survival axiom. Thus moral *evidentia* amounts to more than mere probability. Moreover, once it is assumed that, thanks to the survival axiom, induction can amount to scientific knowledge, the certain generalizations that are based on induction can be used subsequently as the basis for mathematical deductions. In this way 's Gravesande's defence of moral *evidentia* can be seen as a defence of Newtonian physics *as a science* that includes both the inductive and the deductive elements that belong to the *method* of this science. Paradoxically enough, his non-Lockean conclusion concerning the scientific character of Newtonian physics is supported by various individual arguments that are clearly borrowed from Locke.

CHAPTER NINE

PETRUS VAN MUSSCHENBROEK: LOGIC AND NATURAL SCIENCE PART WAYS (1748)

9.1. *Introduction*

Petrus van Musschenbroek was born on 14 March 1692 into a family of instrument makers. His brother Jan (1687–1748) would manufacture the instruments that were used in the lectures in experimental physics by De Volder, W. Senguerd, 's Gravesande and by Petrus himself. Van Musschenbroek studied at Leiden University under various teachers. Senguerd introduced him to experimental physics; a manuscript from 1711 has been preserved that contains notes by Van Musschenbroek on Senguerd's experiments. Yet Van Musschenbroek's main teacher was Boerhaave and it was probably under the latter's influence that he wrote a dissertation on a medical—or rather: biological—problem. In *De Aëris Præsentia in Humoribus Animalibus* (1715) he discusses the problem of how air is absorbed by blood. Van Musschenbroek settled down as a medical doctor in his native city, but in 1717 he made a trip to London, where he followed lessons in experimental physics by Desaguliers. Back in Leiden he continued his study of Newtonian physics under 's Gravesande and in 1719 he was appointed professor in mathematics and philosophy at the university of Duisburg. This German interlude only lasted until 1723, when he accepted the post of professor in philosophy and mathematics at Utrecht University. His years in Utrecht form his most creative period. He produced a book on experiments, the *Physicæ experimentalis, et geometricæ ... dissertationes* (1729) as well as a number of physical textbooks. The last stage in his career was formed by a professorship at Leiden University from 1740 onwards. After 's Gravesande's death in 1742 he took over the post of *professor totius philosphiæ*. Van Musschenbroek retained this professorship until his death in 1761.[1]

[1] On Van Musschenbroek's life see De Pater, *Petrus van Musschenbroek*, pp. 24–32.

Van Musschenbroek is often mentioned in one breath with 's Gravesande as one of the two main Dutch proponents of Newtonian experimental physics. Yet there are differences in focus and accent between the two Dutchmen. Whereas 's Gravesande complemented his activities in experimental physics with an interest in mathematics and in epistemological and methodological questions, Van Musschenbroek was more narrowly a practical investigator who paid special attention to the fields of magnetism, electricity and capillarity, and whose predilection for long series of experiments make him an exponent of Baconian tendencies that had been present in the Dutch Republic alongside the more powerful influence of Descartes (see above, §4.5).

9.2. *Structure and Outline*

Although Van Musschenbroek's keenest interests were clearly in the field of Newtonian physics, his broad assignment as professor in philosophy implied that he also had to teach metaphysics and logic. In 1748 he produced a logical textbook called *Institutiones logicæ præcipue comprehendentes artem argumentandi. Conscriptæ in usum studiosæ juventutis* that he no doubt used for his own lectures. In addition, the *Institutiones* must have had a special appeal in Italy, where it was reprinted in Naples in 1758 and in Venice in 1763.[2] The *Institutiones* consists of eleven chapters:

I. On ideas
II. On judgements and propositions
III. On reasoning
IV. On the comparison of the four figures
V. On finding and ordering middle terms
VI. On conjunctive syllogisms
VII. On composite syllogisms
VIII. On imperfect syllogisms
IX. On [some] brief rules
X. On sophismata
XI. On the method of disputing[3]

[2] Cf. De Pater, 'The Textbooks of 's Gravesande and Van Musschenbroek', *passim.*

[3] Musschenbroek, *Institutiones*: 'I. De Ideis', 'II. De Judiciis & Propositionibus', 'III. De Ratiocinio', 'IV. De Figurarum quatuor comparatione', 'V. De Inveniendo & ordinando medio', 'VI. De Syllogismis conjunctivis', 'VII. De Syllogismis compositis',

These chapters are ordered according to the well-known quadripartite pattern, addressing the subjects of ideas (I), propositions (II), reasoning and, in particular, syllogisms (III–X) and method (XI).

Perusal of the *Institutiones* provides the reader with contradictory impressions about the novelty and conventionality of this work. In the 'Prolegomena' to the *Institutiones* Van Musschenbroek makes the connection between our mental faculties and ideas which is typical for the logic of ideas: 'The intellect is that faculty of the mind which understands or perceives something. Whatever is understood, is called *an idea, a thought* or *a perception.*'[4] In the first chapter ideas are given a Lockean definition (see above, §2.1): 'An idea, perception, notion, thought or sensation is that which is present to a thinking mind.'[5] This chapter is influenced by other Lockean themes as well. Van Musschenbroek expounds on the narrow limits that circumscribe human knowledge.[6] Related to this problem is a typically Lockean weariness about the impossibility of knowledge of substances: 'the ideas of substances are very obscure' and 'we are completely ignorant' about the the way properties inhere in their respective substances.[7] The chapter on ideas also contains a reference to the errors that are related to the association of ideas,[8] and an equally Lockean observation on the difficulty of separating one species from another, given the possibility of intermediate forms.[9]

Yet, Van Musschenbroek manages to put forward a variant of the logic of ideas in its Lockean guise, while at the same time completely refraining from the anti-Aristotelian attacks that are so typical for

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'VIII. De Syllogismis imperfectis', 'IX. De Regulis compendiosis', 'X. De Sophismatibus' and 'XI. De Methodo disputandi.'

[4] *Ibid.* 'Prolegomena', p. 2: 'Intellectus est ea Mentis facultas, qua aliquid intelligit, sive percipit. Quicquid intelligitur, appellatur *Idea, Cogitatio, Perceptio.*'

[5] *Ibid.* I, p. 5: 'Idea, Perceptio, Notio, Cogitatio, Sensatio, est id, quod Menti intelligenti est præsens.'

[6] *Ibid.* I, p. 25: 'ingenium humanum arctis limitibus circumscriptus est'; see also *ibid.* p. 3: 'Sunt omnes Mentis facultates admodum angustis limitibus circumscriptæ'.

[7] *Ibid.* I, p. 15: 'Idcirco substantiarum ideæ sunt valde obscuræ, vix enim earum aliquid, præterquam quod necesse est, ut dentur substantiæ Spirituum, Spatii, Corporis, cognoscimus: quoniam proprietates harum rerum necessario alicui rei inesse debent: sed quid sit substantia uniuscujusque, quomodo illi inhærant proprietates, ignoramus omnino'. See also *ibid.* I, p. 19.

[8] *Ibid.* I, p. 13.

[9] *Ibid.* I, p. 36: 'Insuper difficultas nasci potest, quando res quædam ex una specie in alteram transit, quonam tempore & statu transire dicetur'. Cf. Locke, *Essay*, III. vi. 26, pp. 453–454.

Arnauld, Malebranche, Locke and Dutch followers such as Le Clerc and 's Gravesande. The five predicables are treated without any of Arnauld's misgivings, and the replacement of the ten Aristotelian categories by Locke's triplet of substances, modes and relations takes place without any polemical noise. Furthermore, the customary and obligatory attack against sophistical disputations is not at all linked to Aristotelian logic.[10] Van Musschenbroek agrees with Locke that there are some people who use their brains naturally in such a way that they are able to judge and reason correctly, but then continues with a non-Lockean proviso in which he prefers 'artificial logic' to 'natural logic': 'but these [proponents of natural logic] are often not as certain about truth or error, nor are they able to prove this as well to others as those who have learnt and properly understood the traditional rules of the art, that is of artificial logic'.[11] We have already met this combination of a preference for the way of ideas along with a respect for artificial logic, including many of its Aristotelian properties, in Crousaz and in the Wolffian logic of Engelhard.

Moreover, the bulk of Van Musschenbroek's *Institutiones*, 124 out of a total of 206 pages, is devoted to a completely uncritical discussion of syllogistic reasoning, which had been the favourite scapegoat of all true representatives of the logic of ideas. After the chapters on syllogisms, one final chapter is devoted to method. In the introductory pages to his *Introductio ad philosophiam naturalem* (edited posthumously in 1762 by J. Lulofs) Van Musschenbroek had stressed the function of logic in teaching us 'a method of how to conduct the understanding in order to elicite and demonstrate hidden truths'.[12] By contrast, the entire last chapter of the *Institutiones* is devoted to the method of disputing, although we have come to know this medium as another *bête noire* of the logic of ideas. Van Musschenbroek starts 'De Methodo Disputandi' with some general remarks on the use of disputations in the exercise of the mind, in stimulating the attention of young pupils and in furthering the investigation of truth.[13] He then gives various hints for the correct behaviour of both *defendens* and

[10] *Ibid.* X, p. 193.

[11] *Ibid.* 'Prolegomena', p. 4: 'sed hi multis in occasionibus non sunt adeo clare convicti de veritate aut errore, nec alios tam bene de hisce convincere possunt, quam qui regulas in arte, sive Logica artificiali traditas dedicerunt, & probe intellexerunt.'

[12] Musschenbroek, *Introductio*, 'Prologomena', p. 4: 'methodum dirigendi ingenii, ut latentes veritates eruantur & demonstrentur'.

[13] Musschenbroek, *Institutiones*, XI, pp. 197–198: 'Optimo autem consilio disputationes habentur ad exercendum, acuendum & dirigendum ordine ingenium, ad

opponens. He completely side-steps the modern methodological problems that had been tackled by Van Musschenbroek's predecessors in the logic of ideas.[14]

9.3. *Ideas*

Van Musschenbroek's taxonomy of ideas (simple and complex, clear and distinct, perfect and imperfect, adequate and inadequate, true and false) is basically Arnauldian, while much of its specific content is Lockean. His definition of clarity and distinctness deserves special mention. He holds, with Descartes, that not all clear ideas are distinct, but in addition he also maintains that not all distinct ideas are clear, since according to him an obscure (i.e. an unclear idea) can still be perceived distinctly from all other ideas.[15] So, whereas Descartes had considered distinct ideas a subset of clear ideas (see §2.4), and 's Gravesande had presented clear ideas a subset of distinct ideas (see §8.4), according to Van Musschenbroek ideas that are both clear and distinct form a subset consisting of the cross-section between the set of clear ideas and the set of distinct ideas—but (like 's Gravesande) he does not provide arguments for this particular stance.

Van Musschenbroek starts his chapter on ideas with the Lockean distinction between ideas of substances, modes and relations. When he points out that we can obtain knowledge of the essence of 'ideal things', such as mathematical figures or of ethical concepts like piety, while the nature of God and of his spiritual and corporeal creatures remains inaccessible to us, he echoes Locke's criterion for the distinction between modes and ideas of substances.[16] The

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juvenes incitandos ad diligentiam & æmulationem, ad veritatem investigandam, ad difficultates in Thesi latentes eruendas'.

[14] However, Van Musschenbroek makes some terse remarks about the step-by-step method that should be followed in order to perfect our ideas of substances in *Ibid.* I, p. 20: 'In principio rerum omnium obviarum admodum imperdectas, inadæquatas, & obscuras formamus ideas, quas attentione, examine longo, repetito, & exercitio polimus & perficimus magis magisque, eas reddentes claras & distinctas'. His remarks about induction are equally succint; see *Ibid.* VIII, p. 181: 'Quia humana cognitio a singularibus incepit, patet Inductionem fuisse argumentationem omnium primo in usum vocatam.'

[15] *Ibid.* I, p. 16: 'Et ideæ distinctæ possunt esse claræ, possunt esse obscuræ: nam in obscuris sufficit, ut modo cognoscantur diversæ ab aliis.'

[16] *Ibid.* I, p. 6: 'Quid vero constituat substantiam sive rerum spiritualium, corporum, vel spatii, nequaquam mente assequimur. Modos veros rerum clare percipimus, & quia hi soli non subsistere possunt, substantias simul cum modis concipere

way he discusses substances and modes, however, suggests that he is first of all making an *ontological* distinction between *things* that is not quite the same as Locke's predominantly *epistemological* distinction between different kinds of complex *ideas*. Within this context of different complex ideas, Locke discusses first of all *ideas* of substances, not substance itself. Van Musschenbroek's is ambiguous on this topic. His definition of 'relation' leaves room for both the ontological and epistemological variant: 'A relation is an idea formed by the comparison of two things or ideas.'[17] By contrast, Locke's definition of a relation as a complex idea that 'consists in the consideration and comparing one *Idea* with another'[18] is unambiguous; he does not compare external objects but ideas. Van Musschenbroek's ambiguity may be an example of Leibniz-Wolffian incursions of ontology into the domain of logic (see above, §7.3).

Although Van Musschenbroek's taxonomy of ideas is more exclusively Lockean than that of most other Dutch predecessors, he does not subscribe to all parts of Locke's epistemology. This becomes clear when we read his version of 's Gravesande's survival axiom (see above, §8.6). He points out that simple ideas seem to be perceived in a similar way by all men; that people would not be able to communicate with each other if this would not have been the case; and concludes from the harmony (i.e. the possibility of communicating) between people in general and between mathematicians in particular, that conformity in the perception of simple ideas is indeed possible. He then goes on to make a very non-Lockean point. Our nature is such that we all tend to form the same simple ideas, and it is precisely because of this universal tendency that it is hard to decide whether these ideas are innate.[19]

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solemus, quotiescunque res totas concipimus, nisi abstractione Modum solum concipere voluerimus.'

[17] *Ibid.* I, p. 6: '*Relationem* appello ideam ex comparatione duarum rerum, vel idearum formatam.'

[18] Locke, *Essay*, II. xii. 7: 166.

[19] *Ibid.* I, pp. 8–9: 'Ideo an simplices ideæ animo sint innatæ ignoramus, an vero talis sit animi conditio, ut non possit non ideas simplices efficere sibi similes, nec novas innumeras discrepantes fingere, quæ in societate hominum fuissent inutiles, & turbas deplorandas ei intulissent.'

9.4. *Mental and Verbal Propositions*

Since Van Musschenbroek combines his way of ideas with an old-fashioned predilection for syllogisms, the question arises how he manages to square these elements of two different logics in one and the same treatise. The same problem has already been signalled in Arnauld's *Logique* (see above, §3.1). Van Musschenbroek's solution is largely in accordance with the answer provided for the same problem by Crousaz (see §6.6). In the chapter on ideas (ch. I) Van Musschenbroek pays attention to words as well. We need signs that enable us to communicate ideas; these signs can be natural (tears and laughter) or artificial (words and writing). Terms 'express' ideas.[20] In chapter II, 'On Judgements and Propositions', he starts with a definition of judgements in which ideas and not terms seem to figure as basic elements: 'A judgement is the comparison of two ideas and the perception of their mutual relation'.[21] However, a correct judgement depends on clear and distinct ideas of the constitutive subject and predicate of the judgement. In this way, Van Musschenbroek upholds both the basic elements of Aristotelian verbal propositions, subject and predicate, as well as ideas. Consequently, when he uses the Lockean distinction between mental and verbal propositions,[22] this has the placatory aim of pointing out that propositions consist not only of ideas but also of words. Van Musschenbroek's views on this matter are different from 's Gravesande's opinions, who had used the same distinction between mental and verbal propositions to ventilate his clearly anti-Aristotelian penchant for the former over the latter (see above, §8.4). Although Van Musschenbroek's dual use of both mental and verbal propositions can be regarded as a way of integrating ideas into Aristotelian propositions (and hence syllogisms), the strategy has the obvious danger of confusing two different things, i.e. words and ideas. This was already identified as the weak spot in similar attempts at compromise by Crousaz. Van Musschenbroek does not present a clear solution to this problem either, but at least he is not blind to the danger: 'Mental and verbal propositions are not always suffiently distinguished, since it is difficult to treat them separately'.[23]

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[20] *Ibid.* II, p. 37: 'Verba, quæ ideas comparatas exprimunt, vocantur *Termini correlati*'.

[21] *Ibid.* II, p. 39: 'judicium est duarum idearum comparatio, & perceptio relationis, quam inter se habent'.

[22] *Ibid.* II, p. 40: 'Judicium est proprie Propositio Mentalis, & Effatum est Propositio Verbalis, uti non male notavit Lockius'.

[23] *Ibid.* II, p. 40: 'Propositiones Mentales & Verbales non, prout par erat, distin-

9.5. *Syllogisms*

Chapters III–X of the *Institutiones* are devoted exclusively to syllogistic reasoning. Van Musschenbroek leaves no doubt about the vital importance of syllogisms. Since logic should first of all teach us how to invent and order arguments, and since he holds that this function is performed by syllogisms, he feels justified in devoting the largest part of his logic to syllogistic reasoning.[24] His treatment of syllogisms is largely conventional. He is only mildly original when he formulates rules for the combination of propositions that allow correct syllogisms. Each syllogism is in one of four figures. Within each figure, each of the two premises is either general or particular, affirmative or negative; this means that theoretically there are $4\times4\times4=64$ combinations or modes. Applying his rules, Van Musschenbroek shows that only 10 modes amount to a correct syllogism.[25]

Since Van Musschenbroek has explicitly maintained, contrary to Arnauld, the presence of ideas in propositions (judgements) and since syllogisms consist of propositions, it is not surprising that ideas have a continued presence in Van Musschenbroek's treatment of syllogisms. Following again the example of Crousaz (see above, §6.7), he identifies middle terms with intermediate ideas. Van Musschenbroek formulates this point in such a way, however, that he reverts from the two-stage character of the logic of ideas back to the three-level structure of Aristotelian logic. For Locke, looking for intermediate ideas in order to connect two different ideas never involves any other activity than comparing ideas. Consequently, his logic has only two stages, that of inspecting separate ideas and that of comparing ideas. By contrast, Van Musschenbroek stresses that there is a fundamental difference between the comparison made in judgements, where *two ideas* are compared, and the comparison made in syllogisms, where *two judgements* are compared.[26] Crousaz's attempt at integration of ideas in syllogisms had not implied a rupture with the

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guunter semper, cum difficulter seorsum tractari possunt'.

[24] *Ibid.* III, pp. 73–74: 'argumenta invenire, & rite disponere docet Logica, uti in hoc capite ostendetur: ideo hæc pars merito præcipua prædicatur'.

[25] *Ibid.* III, p. 99.

[26] *Ibid.* III, p. 75: 'Differt Ratiocinatio igitur a judicio, nam in Judicio tantum duæ ideæ comparantur, in ratiocinio autem duo judicia, vel si hæc verbis exprimantur, duæ propositiones, ex quibus colligitur tertia'. See also Engelhard, *Logica*, I. iii. 3, p. 60: '*Ratiocinatio*, alias etiam *judicium dianoeticum, discursus* et *argumentatio* dicta, quæ nihil aliud est, nisi *ea mentis operatio, qua ex duobus judiciis intuitivis inter se comparatis elicitur tertium*' and Wolff, *Philosophia rationalis*, I. i. 1, vol. II, p. 135: 'Est itaque

two-stage logic of ideas; the objects of comparison, both in propositions and also in syllogisms, remained ideas. Van Musschenbroek, on the other hand, takes leave of the two-stage structure by comparing ideas in the case of propositions, but propositions in the case of syllogisms.

9.6. *Conclusion*

Van Musschenbroek follows Crousaz in trying to integrate ideas into Aristotelian propositions and syllogisms. Yet it cannot be said that he tries to offer a full compromise, let alone a synthesis, between Aristotelian logic and the logic of ideas. One of the most interesting properties of the latter logic was the eagerness of its adherents to raise epistemological and methodological problems. Crousaz's attempts at accommodation, although not very dextrous, were at least complete to the extent that he not only addressed the relation between terms and ideas, but also discussed methodological questions. These issues are almost completely omitted by Van Musschenbroek. Although he adopts Locke's basic distinction between modes and ideas of substances, he does not present either a rationalist or an empiricist epistemology or methodology. Consequently we find no philosophical defence of Newtonian physics, although his views on the new science were as positive and as strong as those of 's Gravesande. Van Musschenbroek's adherence to the logic of ideas is qualified in other respects as well. Although he remains attached to ideas beyond a limit where these had been silently dropped by Arnauld (i.e. in subsequent discussions of propositions and syllogisms), his willingness to compare not only ideas but also propositions implies a farewell to the two-stage structure of the logic of ideas and a restoration of the three-level structure of conventional Aristotelian logic.

Rationcinatio operatio mentis, qua ex duabus propositionibus terminum communem habentibus formatur tertia, combinando terminos in utraque diversos.'

CHAPTER TEN

CONCLUSION: DUTCH ECLECTIC LOGIC, 1690–1750

Dutch textbooks on logic between 1690 and 1750 form a completely neglected and yet surprisingly informative platform for a discussion of the problems that had been addressed in the new logic of ideas by Descartes, Arnauld, Malebranche and Locke. These problems pertained to the relation between the content of the new logic and Aristotelian logic, between content and structure, and between rationalist and empiricist epistemologies and methodologies. Several factors combined in making Dutch logical textbooks suitable media for these discussions. In large part thanks to the efforts of Jean le Clerc, who prepared and published an French translation of the 'Epitome' of the *Essay* in 1688, the reception of this work started in the Dutch Republic before it was even printed in Britain. The *Essay* marks the beginning in the Dutch Republic of empiricist reflection on epistemological and methodological problems within the logic of ideas. However, empiricism never acquired the status of exclusive orthodoxy. Although Cartesian physics was clearly in decline by the end of the seventeenth century, Descartes's metaphysics continued to play a role as a general philosophical framework during the first half of the eighteenth century. Perhaps even more tenacious was Aristotelian logic, which—not unlike the later Ottoman empire—stubbornly refused to pass out of existence, although it was in a state of almost universally acknowledged decline. Regius' *Epitome* (1705) was by no means an isolated instance of Aristotelianism that survived the turn of the new century; and peripatetic syllogisms even made a strong comeback at the very end of the period under consideration, in Van Musschenbroek's *Institutiones logicæ* (1748).

The three main philosophical currents of thought in the Dutch Republic (Aristotelianism, Cartesianism and empericism) persisted side by side, turning eclecticism into a hallmark of Dutch philosophy between 1690 and 1750. Although the concepts 'rationalist' and 'empiricist' have been used mainly to distinguish *between* early modern philosophers, these concepts are perhaps more useful to make distinctions *within* the works of individual philosophers. The most furious battles in the Netherlands were hardly waged between

rationalists and empiricists, but rather between Aristotelians on the one hand and logicians of ideas—whether of rationalist or empiricist persuasion—on the other. In no discipline was the hold of Aristotelianism as firm and as persistent as in the field of logic. Consequently, the polemics between old logic and various forms of the new logic remained relevant in the period between 1690 and 1750. The alliance of Moderns versus Ancients was facilitated by the fact that the Dutch Republic was the home of a Cartesianism that was less dogmatic and not as inimical to experimental physics as its French counterpart. This allowed Dutch philosophers to consider Descartes and Locke not as adversaries, but as joint defenders of an alternative logic of ideas in which new principles of correct reasoning were used to attack the sterile intricacies of traditional Aristotelian learning and peripatetic logic in particular.

In the Republic eclecticism was more often an asset than a liability. When, in the late 1730's, Dutch translations of Wolff's works introduced Leibniz-Wolffianism as a fourth major philosophical coefficient in the eclectic equation, the success of these books was largely due to the wide demand for any comprehensive survey of modern philosophy—regardless of its precise epistemological and methodological credentials. Similarly non-exclusive was a flattering review in the Dutch-based *Journal des Sçavans*, of the French translation of 's Gravesande's *Introductio ad philosophiam*, in which the expectation was expressed that 'With the help of this work [students] will be able to make more progress and better understand *Locke, Leibniz, Malebranche* etc. We know of no better *Introduction to philosophy*'.[1]

The fact that serious philosophy in the Dutch Republic was first of all academic philosophy, did little to alter, and may even have contributed to its eclectic character. The curricula combined Newtonian physics and mathematics with Cartesian metaphysics and Wolffian practical philosophy. Dutch academic textbooks on logic were similarly eclectic. Although logic remained a compulsory subject in the philosophical curriculum, the impression is that by 1690 a process of at least quantitative decline was definitively under way. Textbooks on logic published in the Dutch Republic (and elsewhere in Europe) became slimmer, the number of new publications dwindled, and ever less academic disputations were devoted to logic. In his *Repertorium* of Dutch philosophy, J.J. Poortman mentions sixteen new titles

[1] 'Avec ce secours ils seront en état d'aller plus loin, & de bien entrendre *Locke, Leibniz, Malebranche* &c. Nous ne connoissons point de meilleure *Introduction à la Philosophie*', *Journal des Sçavans* 116 (September 1738), p. 80.

published on logic between 1601 and 1650, eleven between 1651 and 1700, seven between 1701 and 1750 and only three between 1751 and 1800 (numbers include translations from works published originally outside the Republic).[2] Yet these very epitomes of an antiquated scholastic form that was slowly sinking into oblivion often managed to maintain an actuality that is partly due to specific curricular circumstances. Professors in philosophy held chairs in logic, natural philosophy, moral philosophy and metaphysics, but there were no chairs for what in the seventeenth century had become the innovative *subjects*—if not yet academic *disciplines*—of epistemology and methodology. Dutch logical textbooks offered an academic platform for the epistemological and methodological issues raised by the logic of ideas.

Although Dutch logical textbooks proved their flexibility in matters of content, a different picture arises once their structure is taken into account. Aristotelian logic had a structure that was determined by terms, propositions and syllogisms, to which Arnauld had added another part on method. The resulting quadripartite structure dominates all the Dutch logical textbooks produced between 1690 and 1750. This tenacity is remarkable, given the fact that the logic of ideas made demands that were clearly at odds with this structure. Moreover, by 1690, different answers to these requirements were available to Dutch philosophers. Whether the new logic was structured around faculties (as in Malebranche's *Recherche*) or around ideas (as in Locke's *Essay*), the result in both cases differed fundamentally from the traditional Aristotelian structure. Malebranche and Locke had no desire of accommodating their work to the format of an academic textbook. Yet in order to be taught as an academic discipline, which in Dutch circumstances was an important requirement indeed, logic had to comply with the traditional Aristotelian format.

However, although structural variation was subjected to stricter limitations than variation in content, there were developments in structure as well. The story of the development of the logic of ideas in relation to traditional textbooks can be told in terms of the relative structural attention given to method and syllogisms respectively. Method had started inauspiciously enough. Robert Sanderson, after a substantial discussion of syllogisms, had added a small appendix on method to his *Compendium*. Arnauld in his *Logique*, on the other hand, maintained a third part on syllogisms, albeit with evident aver-

[2] Poortman, *Repertorium*, pp. 83–84.

sion, while at the same time upgrading the status of method by giving it a proper fourth part. The trend was continued by Le Clerc, who confirmed the ephemeral place of syllogisms in the logic of ideas by placing them at the end of his logic. Finally, in a complete mirror-image of Sanderson, 's Gravesande ended his *Introductio ad philosophiam* with a third and last part on method, that was followed by a short discussion of syllogisms in an appendix—and even this succinct and ephemeral treatment of the subject still made him subject to the ridicule of the enlightened thinker Jean-Baptiste Boyer, Marquis d'Argens (1703–1771).[3] Another example of novelty within the existing Aristotelian structure can be found in Crousaz's *Compendium*, who had used the first part of this work to present both a taxonomy based on the faculties, as well as a division based on ideas.

Eclecticism in Dutch logical textbooks pertained not only to epistemological and methodical variations within the new logic, and to various intermediate solutions on a structural level, but gave rise to compromises between the content of Aristotelian logic and the logic of ideas as well. This is a notable development, since Descartes, Arnauld, Malebranche and Locke, for all the diversity of their epistemological and methodological views, had derived much of their common identity exactly from an inveterate anti-Aristotelianism. The way of ideas, the analysis of our faculties, and the whole vast area of epistemology and method, were all formulated with the common aim of providing an alternative to what was perceived as the fruitless sophistry of moribund Aristotelian scholarship. The purest Dutch representatives of this stance were Le Clerc and 's Gravesande. Some of their colleagues were prepared to compromise, but when compromises involved any of the essential features of the new logic, its very identity became, of course, questionable. Although Crousaz can still be called a logician of ideas, his tendency to identify intermediate ideas with middle terms, and his dual defence of both a Cartesian

[3] Boyer, *La philosophie du bon-sens*, p. 263, quoted in Allamand, 'Histoire de la vie et des ouvrages de Mr. 's Gravesande', p. xlix; Allamand, *ibid.* p. xlix comments: 'Il ['s Gravesande] n'a pas voulu parler dans le corps de sa Logique, de cet Art Syllogistique, quoiqu'il le regardât comme une invention très ingénieuse, où tout ce qui a rapport aux règles du raisonnement, est démontré suivant la méthode des Mathématiciens: mais il ne le jugeoit pas nécessaire pour la découverte de la verité: il croyait qu'on pouvait s'en passer. Cependant comme il est en usage dans les disputes académiques, il ne pouvoit pas se dispenser de l'expliquer. C'est ce qui l'a engagé à ajouter ce Traité à sa Logique. Il semble que cette raison l'auroit dû mettre a l'abri de toute critique; mais cela n'arriva pas. Un Ecrivain, dont la plume s'exerçoit sur toutes sortes de sujets, s'avisa de le tourner en ridicule à l'occasion de ce Traité.'

and an Aristotelian methodology stretch the concept of a 'logic of ideas'. This concept comes under even heavier pressure in the logic of Engelhard, who retains the vocabulary of ideas, but whose accentuation of an ontological perspective and a narrow and specific methodological scope is a clear sign of his Leibniz-Wolffian sympathies. A similar proviso should be made for Van Musschenbroek, who presents a very Lockean taxonomy of ideas, but who at the same time effectively switches back from the two stages of the logic of ideas to the three levels of Aristotelian logic, while also discarding the epistemological and methodological discussions that had been one of the salient characteristics of the new logic.

Finally, comparing Van Musschenbroek with 's Gravesande reminds us that tradition and novelty are relative concepts. Although they were the two brightest Dutch Newtonians, and although both felt obliged to write a logic because, in addition to their lectures on physics, they also had to teach other branches of philosophy, their logical textbooks can hardly be more different. One of the main differences is that 's Gravesande used his logic to give a philosophical defence of Newtonian physics, while Van Musschenbroek did nothing of the kind. 's Gravesande was still part of a tradition in which the science of physics was supposed to produce a certain understanding of nature by an understanding of its causes and its essence, and in which physics was part of a more comprehensive philosophy from which it received a metaphysical and epistemological justification. This quest for a certain and complete picture of the world had been shared by Descartes as much as by Aristotelian philosophers; the former had tried to supplant the latter, but the claims of both systems had the same universality. 's Gravesande's use of his logic as vehicle for a philosophical justification of Newtonian physics is typical for a time when such a justification was still deemed necessary at all. The spectacular successes of Newtonian physics, however, began to cast doubt on the necessity or desirability of any deeper philosophical justification at all. Van Musschenbroek, whose interests were more narrowly limited to the field of practical physical experiments than those of 's Gravesande, can be regarded as an instance of this newer trend. If he did not use his logic for a philosophical defence of his physics, this may be due to the fact that he simply failed to see the need for any such venture—which indeed is a more modern view than even 's Gravesande, the most radical of Dutch logicians of ideas, could have imagined.

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